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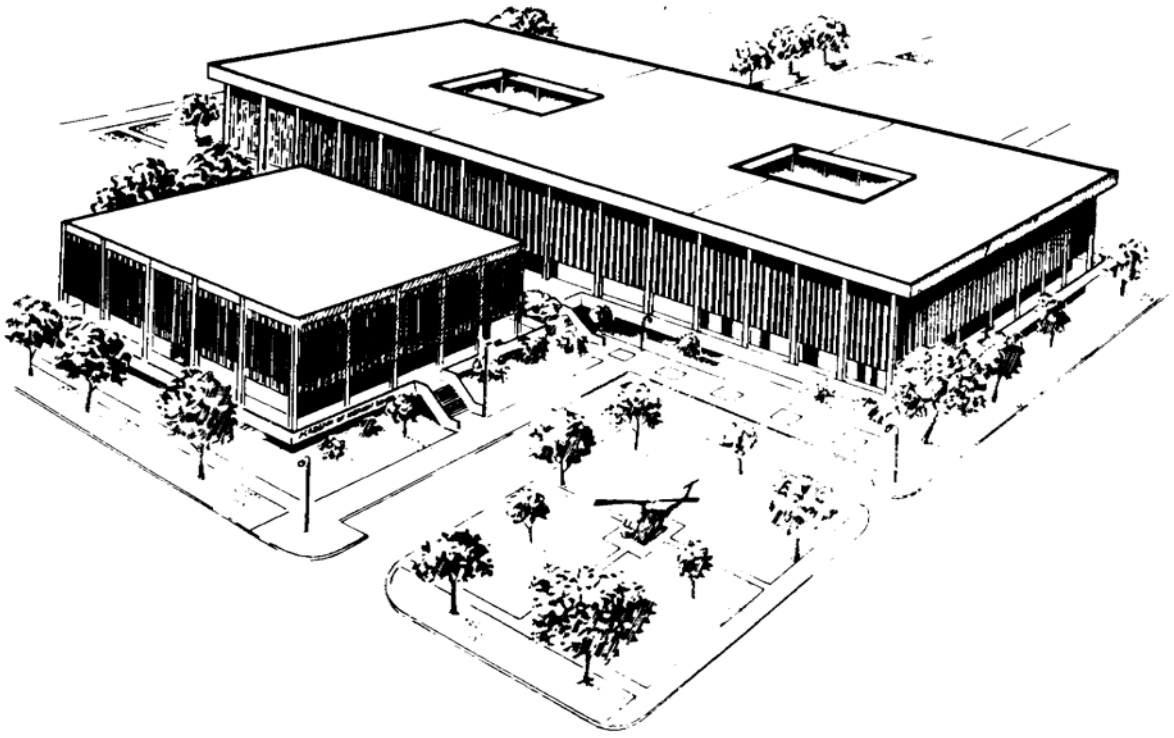
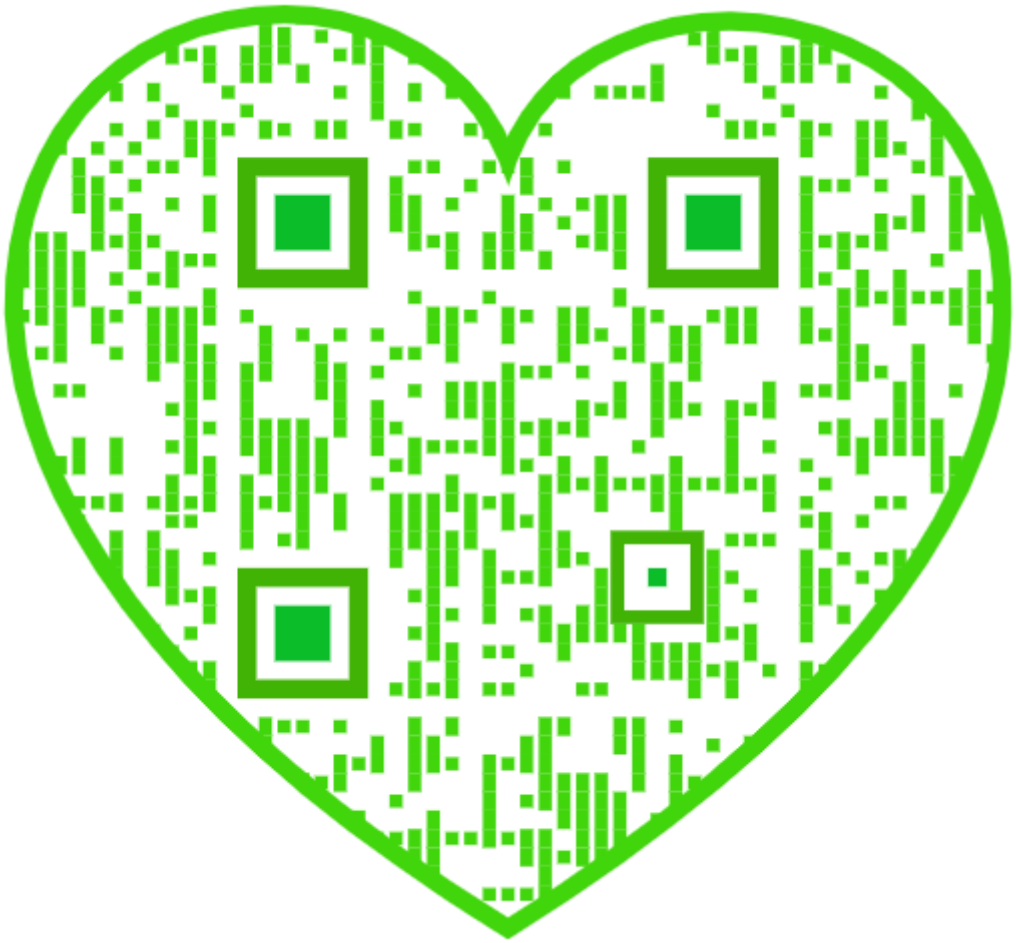


NURSING CARE RELATED TO THE MUSCULOSKELETAL SYSTEM

SUBCOURSE MD0916 **EDITION 100**



DEVELOPMENT

This subcourse is approved for resident and correspondence course instruction. It reflects the current thought of the Academy of Health Sciences and conforms to printed Department of the Army doctrine as closely as currently possible. Development and progress render such doctrine continuously subject to change.

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CLARIFICATION OF TRAINING LITERATURE TERMINOLOGY

When used in this publication, words such as "he," "him," "his," and "men" are intended to include both the masculine and feminine genders, unless specifically stated otherwise or when obvious in context.
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CORRESPONDENCE COURSE OF THE
UNITED STATES ARMY MEDICAL DEPARTMENT CENTER AND SCHOOL

SUBCOURSE MD0916

NURSING CARE RELATED TO THE MUSCULOSKELETAL SYSTEM

INTRODUCTION

The relationship between the patient and personnel providing nursing care can be an important factor in the patient's recovery. The nursing staff must have the knowledge and skills required to meet the physical and emotional needs of the patient. The patient should be able to place his trust in the nursing staff, confident that well-trained, responsible individuals are assisting him and are interested in his well-being and return to good health and independence.

The patient should not be thought of as the condition that brought him to the hospital. Health care providers should never refer to a patient as "the fractured hip" or "the ruptured disk." A comment of this type is very impersonal and may give a negative impression of the staff if overheard by the patient or by a family member.

Because nursing paraprofessionals have close, bedside contact with the patient, they are often first to observe a complication in his condition. Their bedside presence should create a therapeutic environment. To foster this environment, the nursing paraprofessional should do the following:

- Assess the patient's ability to express himself.
- Assess the patient's ability to cope with his condition.
- Assess the patient's level of understanding about his condition and the teaching provided by the health care professionals.
- Assist the patient in establishing a trusting relationship with the health care providers.
- Utilize the nursing process to provide the best possible care.
- Sustain and enhance his own professional knowledge and skills through continuing education and training.

The purpose of this subcourse is to enhance your knowledge of medical-surgical nursing care related to the musculoskeletal system and the role of the nursing paraprofessional in providing that care.

Subcourse Components:

This subcourse consists of one lesson and one appendix.

Lesson 1. Nursing Care Related to the Musculoskeletal System.

Appendix: Universal Body Substance Precautions.

Study Suggestions:

Here are some suggestions that may be helpful to you in completing this subcourse:

--Read and study each lesson carefully.

--Complete the subcourse lesson by lesson. After completing each lesson, work the exercise at the end of the lesson, marking your answers in this booklet.

--After completing each set of lesson exercises, compare your answers with those on the solution sheet that follows the exercise. If you have answered an exercise incorrectly, check the reference cited after the answer on the solution sheet to determine why your response was not the correct one.

Credit Awarded:

To receive credit hours, you must be officially enrolled and complete an examination furnished by the Nonresident Instruction Branch at Fort Sam Houston, Texas. Upon successful completion of the examination for this subcourse, you will be awarded 7 credit hours.

You can enroll by going to the web site http://atrrs.army.mil and enrolling under "Self Development" (School Code 555).

A listing of correspondence courses and subcourses available through the Nonresident Instruction Section is found in Chapter 4 of DA Pamphlet 350-59, Army Correspondence Course Program Catalog. The DA PAM is available at the following website: http://www.usapa.army.mil/pdffiles/p350-59.pdf.

LESSON ASSIGNMENT

LESSON 1 Nursing Care Related to the Musculoskeletal System.

TEXT ASSIGNMENT Paragraphs 1-1 through 1-61.

LESSON OBJECTIVES After completing this lesson, you should be able to:

1-1. Select the goal of orthopedic nursing.

1-2. Identify at least five observations that should be made during a nursing assessment of an orthopedic patient.

1-3. Identify at least five questions that should be asked when assessing a patient's orthopedic pain.

1-4. Select the procedures that should be used to instruct crutch-walking gaits.

1-5. Select four reasons for the use of casts.

1-6. Select the correct nursing management techniques used in caring for a patient with a cast.

1-7. Select the correct procedure for turning a patient in a spica cast.

1-8. Select five reasons for the use of traction.

1-9. Identify two basic methods of applying traction.

1-10. Match the correct definition to the terms contusion, sprain, strain, and dislocation.

1-11. Identify the signs and symptoms associated with fractures.

1-12. Given a description of a fracture injury, correctly classify that fracture.

1-13. Identify the three principles of fracture management.

1-14. Given a description, select the principle of fracture management.

1-15. Select the nursing observations to be made when assessing a patient with a fracture.

1-16. Identify the signs and symptoms of four life-threatening complications of fractures.

1-17. Identify five reasons for amputating an extremity.

1-18. Given a list, select the nursing care implications involved in the care of a person who has undergone an amputation.

1-19. Given the location or description, identify the major bones of the body.

1-20. Select the procedure used to fit a patient for crutches.

1-21. Identify the tripod position.

1-22. Given a description, identify two types of traction.

1-23. Identify the nursing care management principles for a patient in traction.

1-24. Identify the difference between an open amputation and a closed amputation.

1-25. Select six factors that are considered by the physician when determining the location for amputation.

1-26. Identify the pathological changes seen in rheumatoid arthritis, osteoarthritis, and gout.

1-27. Identify the use, side effects and nursing care implications of drugs related to the musculoskeletal system.

SUGGESTION

After studying the assignment, complete the exercises at the end of this lesson. They will help you to achieve the lesson objectives.

LESSON 1

NURSING CARE RELATED TO THE

MUSCULOSKELETAL SYSTEM

Section I. INTRODUCTION TO ORTHOPEDIC NURSING

1-1. THE MUSCULOSKELETAL SYSTEM

a. The musculoskeletal system is composed of bones, joints, muscles, cartilage, ligaments, and tendons. The skeleton provides a structural framework for the body and, because bones are rigid, provides support and protection for vital organs and softer tissues. Skeletal muscles and bones work together to make body movement possible. Blood cell formation (called *hematopoiesis*) occurs in bone marrow, and bones store minerals such as calcium and phosphorus.

b. Orthopedics is the branch of medicine and surgery that is concerned with the preservation and restoration of the function of the skeletal system, its articulations (joints), and its associated structures by medical, surgical, and physical means.

c. Refer to figure 1-1 to refresh your knowledge of the names and locations of the major muscles and bones.

1-2. ORTHOPEDIC NURSING

a. The challenge in caring for the orthopedic patient is in carrying out basic nursing care procedures while understanding and working with orthopedic devices used in the treatment of musculoskeletal diseases and injuries. To avoid self-injury, those engaged in orthopedic nursing must also understand and apply principles of good body mechanics.

b. Many orthopedic patients are immobilized by casts, traction, or other means for long periods of time. Orthopedic nursing includes maintaining muscle tone and circulation to prevent contractures, deformity, and pressure sores by frequently changing the position of immobilized patients.

c. Often confined to bed and in many cases immobile, the orthopedic patient may require a great deal of assistance with daily living activities. His bedding should be kept clean, dry, and wrinkle free. Because he is susceptible to skin breakdown and pressure sores, he should be assisted and encouraged to change positions within the limits prescribed by the physician. He should be encouraged to be as independent as possible within the limits of his immobility and personal hygiene should be emphasized.

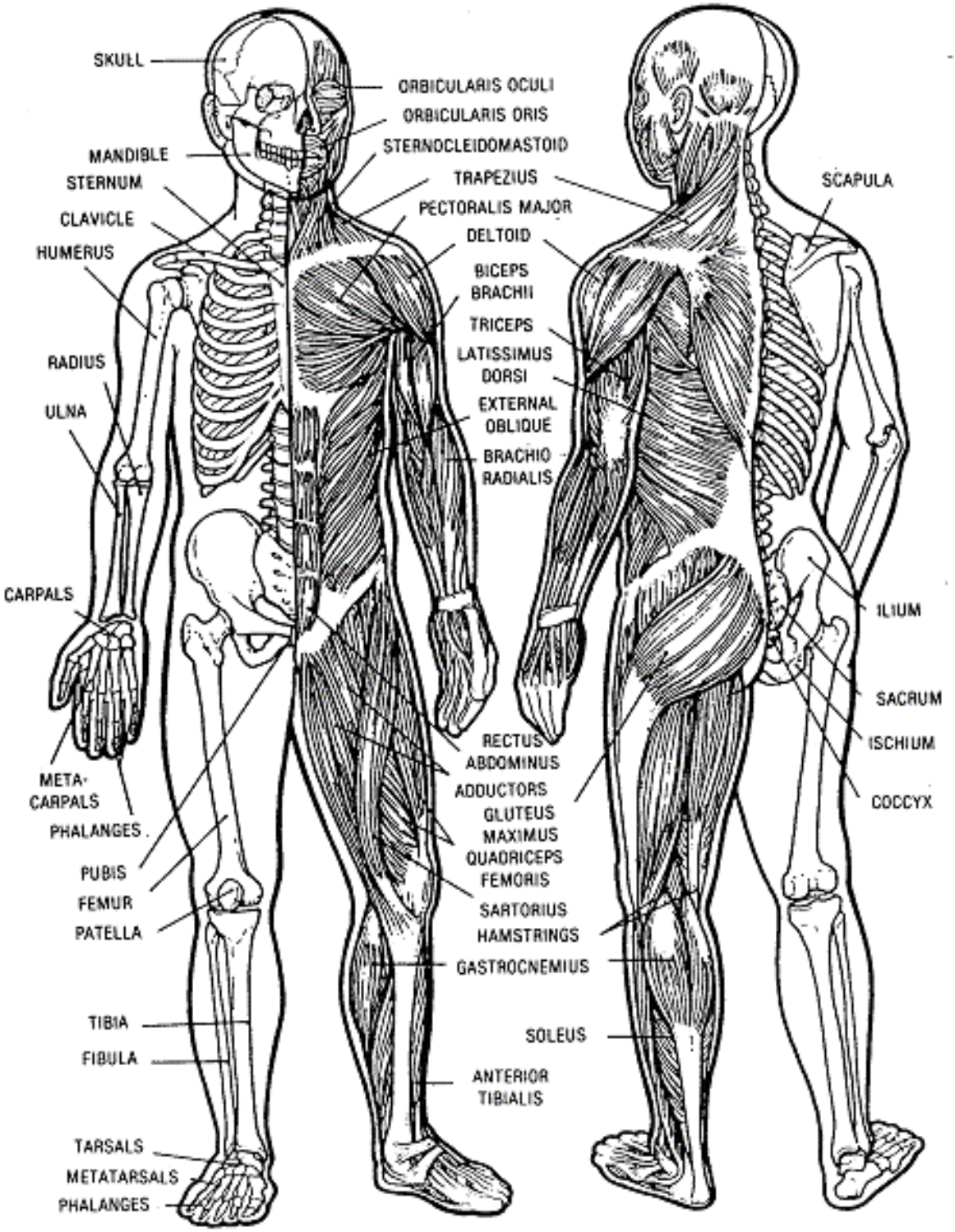


Figure 1-1. Musculoskeletal system.

d. Immobility, fear of deformity, and a potentially long hospitalization may cause the patient to become depressed or discouraged. The understanding and encouragement of nursing personnel can increase morale. Encourage self-reliance, but give help willingly and cheerfully when the patient needs assistance. Continuous teaching will help the patient understand his condition and his limitations and enable him to become more independent as his condition improves and he is rehabilitated.

Section II. ASSESSMENT

1-3. PHYSICAL ASSESSMENT

Management of orthopedic patients begins with an accurate assessment of the patient's specific problems. Important information can be obtained from the patient's history and the physical assessment. An orthopedic nursing assessment should include the following examinations and observations:

a. Observe the patient's posture and gait.

b. Palpate the skin for indication of tenderness, swelling, or increased temperature.

c. Observe for discoloration.

d. Examine the joints, observing for size, shape, alignment, and range of motion.

e. Examine the muscles for strength, movement, and indications of atrophy or contracture.

f. Assess vascular function by "blanching" fingers and toes. Check pulses.

g. Assess neurological function by checking reflexes, sensation, and motor ability.

1-4. DIAGNOSTIC ASSESSMENT

a. Radiography is the most widely used procedure for evaluating patients with musculoskeletal disorders. X-rays of a joint may show spur formation, changes in joint structure, or the presence of fluid. X-rays of bone may show bone texture, density, and erosion or other bone changes. Special X-ray techniques include the following.

(1) Tomography, or body section roentgenography, is the recording of internal body structures in a specific plane of tissue. Computerized Axial Tomography, or CAT scan, uses both X-rays and computers to create three-dimensional images that appear on a screen in cross-sectional view.

(2) Myelography outlines the subarachnoid space and may show spinal cord distortions, herniated intervertebral discs, or the presence of lesions. A contrast medium (radiopaque dye, oxygen) is injected into the spinal subarachnoid space by lumbar puncture and X-ray films are taken.

(3) Arthrography involves the injection of radiopaque substance or air into the joint cavity in order to outline the soft tissue structures and joint contour.

b. Arthrocentesis is the insertion of a needle into a joint and the aspiration of synovial fluid for examination.

c. Electromyography (EMG) is the recording of the electrical properties of skeletal muscles in order to study aspects of neuromuscular function and conduction. This test helps determine any abnormal physiology.

d. Thermography is a technique using infrared cameras to photographically portray the degree of heat radiating from the skin surfaces. It is used to investigate underlying pathologic processes.

e. Arthroscopy is visual examination of the interior of a joint by using a small fiberoptic instrument called an arthroscope.

f. Scintiscan is a procedure that provides a two-dimensional representation of the gamma rays emitted by a radioactive isotope, revealing its concentration in specific body tissues. In bone scanning, the patient is given an intravenous injection of bone-seeking radioactive isotope and the body is "scanned" for increased isotope uptake. Increased concentrations of isotope uptake are associated with primary skeletal disease, metastatic bone disease, osteomyelitis, and some types of fractures.

g. Magnetic resonance imaging (MRI) is an imaging process that makes rapid, detailed pictures of body tissue. The patient is placed in a giant, horizontal cylinder and exposed to a magnetic field 15,000 times greater than the earth's natural magnetic field. No discomfort is experienced with this procedure.

1-5. NURSING CARE OF PATIENTS UNDERGOING DIAGNOSTIC PROCEDURES

a. Many diagnostic procedures require minimal nursing intervention. Often, all that is required is that the nursing staff deliver the right patient to the appropriate clinic at the designated time. Nursing personnel should explain the procedure to the patient, reassure him, and, if possible, show him the equipment. When the patient is returned to the ward, his status upon completion of the procedure should be documented by nursing personnel. Some procedures, however, may require a specific patient "prep" beforehand while others may require specific follow-up observations. Nursing personnel should be familiar with the various diagnostic procedures or refer to local departmental standing operating procedures when unsure about preps and follow-up procedures.

b. Invasive procedures, such as the myelogram, arthrocentesis, and arthroscopy, require the application of sterile dressings over the puncture sites. The puncture sites must be observed for signs and symptoms of infection and the dressings changed in accordance with the physician's orders or local Department of Nursing standing operating procedures. Additionally, the patient may be required to remain on bed rest for a period of time after the procedure.

c. Basic nursing considerations in the care of patients undergoing diagnostic examinations include the following:

(1) Ensure that any pre-procedural patient prep has been completed.

(2) Have the right patient in the right place at the right time.

(3) Bring previous X-rays, the patient's chart, or any other materials required by the department performing the procedure.

(4) Have an attendant available to remain with the patient, if required by local policy or circumstances.

(5) Comply with post-procedural physician's orders.

(6) Observe the patient for pain and/or other side effects or reactions associated with the procedure.

(7) Enter appropriate documentation of all that has been done in the patient's chart.

1-6. PAIN

a. Most patients with disorders of bones, joints, and muscles experience pain. Orthopedic nursing assessment and management of pain must be individualized as each person will have a different threshold and tolerance for pain.

b. Bone pain is described as a deep, dull, boring ache, as opposed to muscle pain, which is described as a soreness or aching.

c. Increasing pain may indicate an infectious process, malignancy, or vascular problem. Pain that increases only with activity may indicate joint or muscle sprain.

d. Sharp pain may be related to a bone infection with muscle spasm, pressure on a sensory nerve, or fracture pain, which is both sharp and piercing.

e. Radiating pain is seen in conditions where pressure is exerted on a nerve root.

1-7. NURSING ASSESSMENT OF ORTHOPEDIC PAIN

a. When assessing and evaluating the patient's pain, you should make the following determinations.

(1) What was the patient doing before the pain began? How did it begin?

(2) How does the patient describe the pain? Is it localized? Does it radiate? Is it continuous or intermittent?

(3) What is the character of the pain? Is it sharp, dull, piercing, shooting, cramping, or throbbing?

(4) What relieves the pain? What makes it worse?

(5) Is the patient's body in proper alignment?

(6) Is the patient experiencing pressure from casts, splints, traction, or other objects?

(7) What is the status of the circulation, sensation, and motor function in the affected area now as compared to previous checks?

b. Careful assessment and evaluation of the patient's pain will allow the nursing staff to determine the appropriate nursing intervention required. The nursing management might involve such actions as repositioning the patient, support or elevation of affected limbs, application of heat or cold, or the administration of analgesics, sedatives, or muscle relaxants as ordered by the physician.

(1) Repositioning. If the patient's body is out of alignment or a limb has moved to an abnormal position, all that may be required is to realign the body or reposition the affected limb. Proper body alignment is a key factor in patient comfort.

(2) Support. An affected limb may require support or elevation on pillows in order to reduce swelling and reduce strain on the associated musculature.

(3) Circulation. Application of heat or cold is useful in promoting circulation and reducing swelling.

(4) Medication. Prescribed medications such as analgesics, sedatives, and muscle relaxants are administered to control pain. (Other nursing measures should be utilized prior to administering medication since relief of pain may be achieved by using one of the simple nursing measures listed above.)

Section III. SPECIAL EQUIPMENT

1-8. THE ORTHOPEDIC BED

a. The basic orthopedic bed is a standard hospital bed with a firm mattress. A slatted orthopedic bedboard may often be placed under the mattress for extra support.

b. The basic orthopedic bed often requires an over bed frame to accommodate any traction or suspension system that may be required. The framework is inserted into or clamped to the corners or ends of the hospital bed. The frame allows the utilization of adjustable pulleys, slings, harnesses, clamps, and other attachments. The Balkan frame, illustrated in figure 1-2, is one example of an over bed frame. The Balkan frame is standard equipment in US Army patient care facilities, but other types of equipment are used as well.

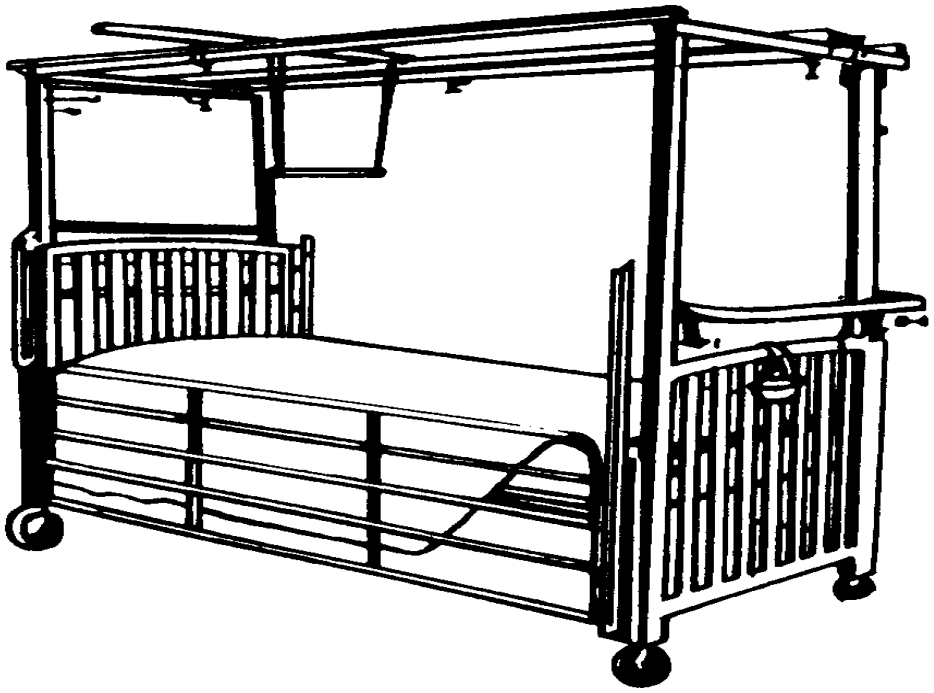


Figure 1-2. Balkan frame.

c. The trapeze is an attachment that is used to assist the patient in movement during activities of daily living. Bathing, linen changes, bedpan use, and repositioning are made easier with the use of the trapeze. The trapeze is grasped firmly with the hands and a "pull-up" movement lifts the upper body and buttocks from the bed. The patient may use an unaffected leg for assistance by flexing the knee, placing the foot flat on the mattress, and pushing down on the bed while pulling straight up on the trapeze.

1-9. SPECIAL ORTHOPEDIC BEDS--TURNING FRAMES

a. Turning frames are devices used to provide immobilization and to facilitate nursing care for the patient who, while immobilized, requires frequent repositioning from supine to prone. In addition to its orthopedic applications, a turning frame is used in the treatment of patients with such conditions as spinal cord injuries and severe burns.

b. The major advantage in the use of turning frames is the prevention of the complications given below.

(1) Pressure sores. With relief of pressure from body weight on bony prominence and pressure areas, blood supply is improved. Additionally, large body areas may be exposed for skin care.

(2) Respiratory congestion. Rotation of the patient from face-up to face-down aids in loosening and ridding the lungs of fluid accumulation. The patient can cough and expectorate more effectively in the prone position.

(3) Kidney and bladder complications. Rotation of the patient aids in elimination of urine sediments that are potential causes of kidney stones.

c. Nursing management of a patient in a turning frame is the same as for any other immobilized patient. The nature of the care required depends upon the reason for immobilization (casts, traction, paralysis, and so forth). Nursing care of the immobilized orthopedic patient is discussed later in this lesson in Sections V and VI.

1-10. TYPES OF TURNING FRAMES

a. **Double Frames**. The Foster reversible orthopedic bed (see figure 1-3) and the Stryker turning frame (see figure 1-4) are commonly used. Both are double frames, which are rotated on the longitudinal (side-to-side) axis. The operation of both is similar in principle, with variations in the details of preparation for use. Both have a rotary-bearing turning apparatus at each end, which allows traction to be maintained during the turning process. The patient is "sandwiched" between two canvas-covered frames when he is turned. The anterior frame, on which the patient lies prone, is constructed of either two pieces of canvas or one piece of canvas with a perineal cutout. The posterior frame, on which the patient lies supine, is constructed with two pieces of canvas that have an open space between them for the buttocks. A canvas buttocks strap is used between the two sections to keep the buttocks from sagging. This strap is removed only for skin care or bedpan use.

b. **Improvised Litter Frames**. Two canvas litters, padded with blankets, may be used as anterior and posterior frames when commercially manufactured frames are not available. The frames are placed on sawhorses for greater stability, but may also be used with standard litter brackets. Litter straps are used to bind the two frames together for turning.

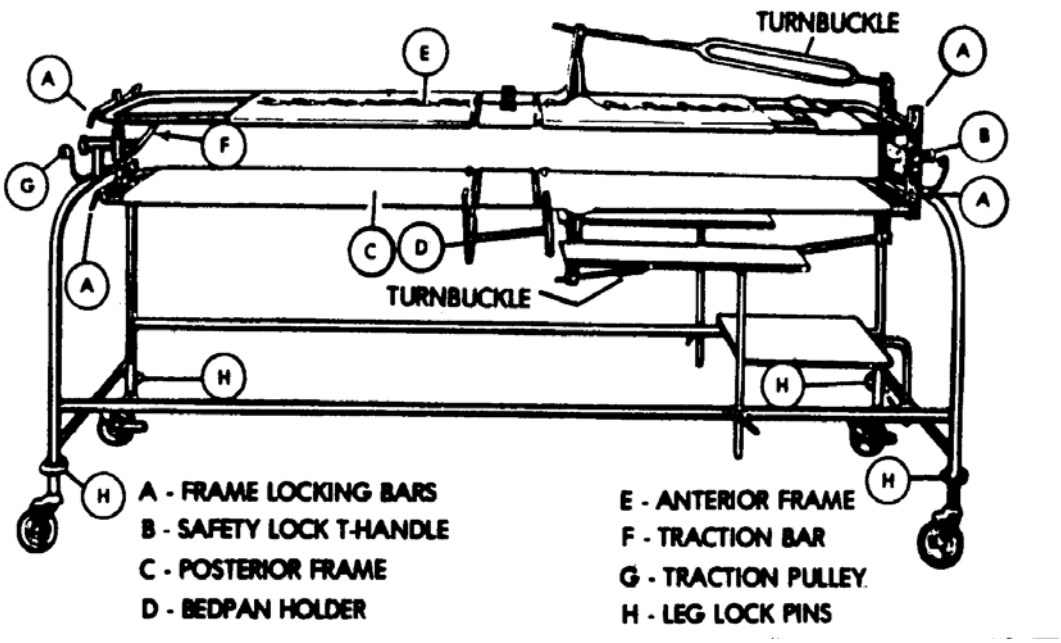
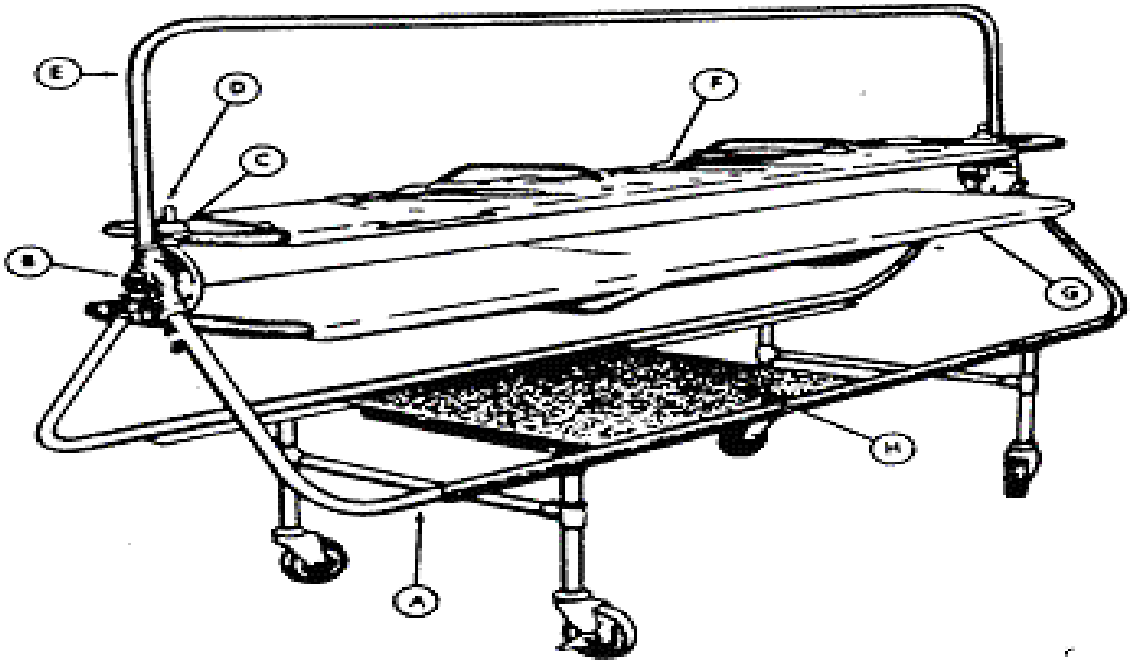


Figure 1-3. Foster frame.



A - CART
B - LOCK PIN
C - LOCKING NUT
D - PIVOT PIN
E - OVERHEAD BAR
F - ANTERIOR FRAME
G - POSTERIOR FRAME
H - UTILITY TRAY

Figure 1-4. Stryker frame.

c. **Circo-Electric Beds**. A circo-electric bed (see figure 1-5) is an electrically powered apparatus, which can be used as a turning frame for vertical (end-over-end) rotation. It can also be utilized as a tilt table and for unrestricted gatch positioning.

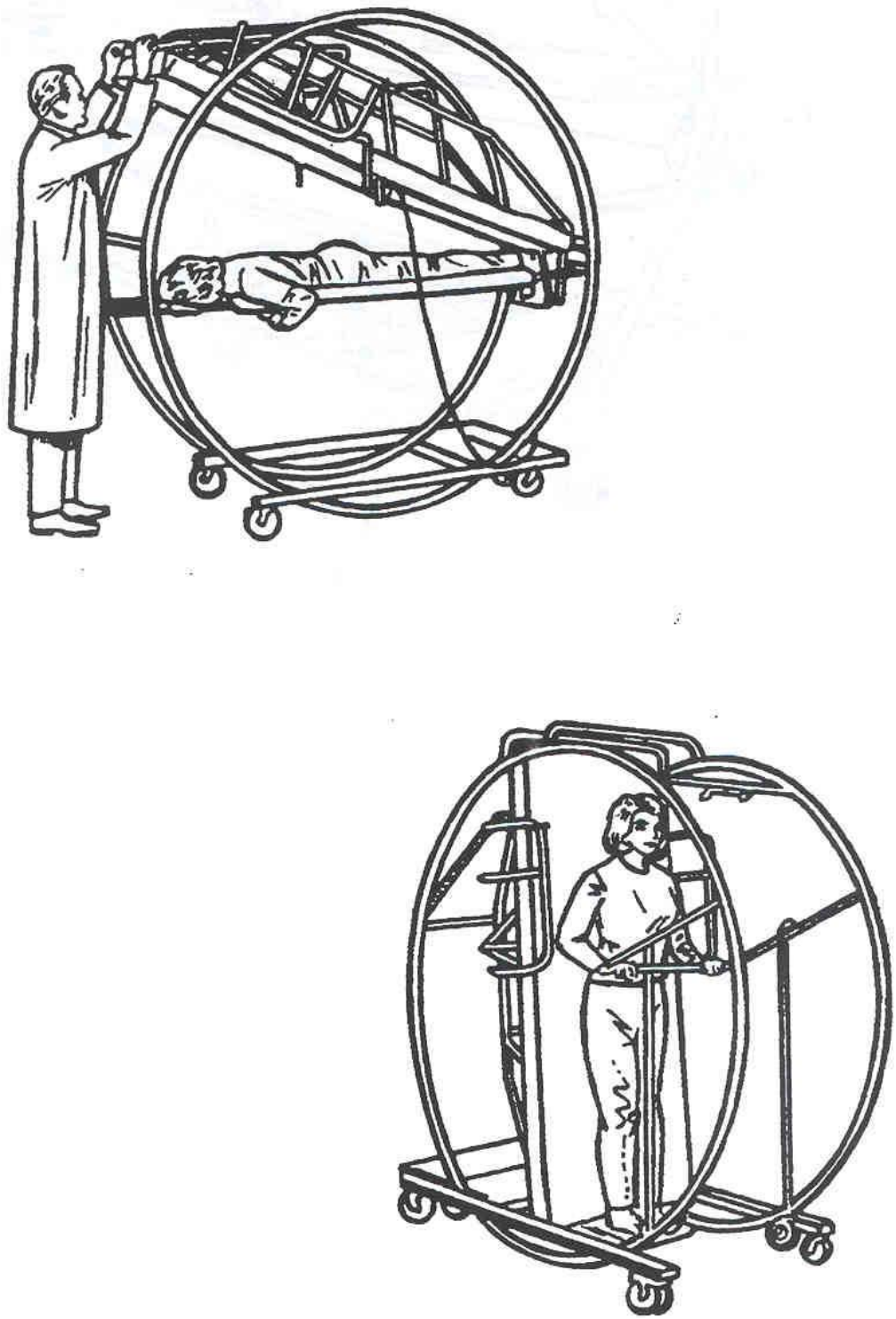


Figure 1-5. Circo-electric bed.

Section IV. MOBILIZATION AIDS

1-11. WHEELCHAIRS

a. The folding wheelchair is the most commonly used mobilization device for a patient who can sit upright. If leg elevation is required, a special board or leg attachment can be secured to the chair and pillow or cushion support provided. The use of a wheelchair allows the patient to be out of bed, mobile, and moderately independent.

b. Patients must be instructed in the proper use and operation of a wheelchair. Place the patient in the chair with his feet on the footrest plates and instruct him in the following maneuvers:

(1) Show the patient how to lock and release the wheel brakes.

(2) Show the patient how to place his hands on the turning rims and roll the rims forward with even force to produce straight-ahead movement.

(3) Show the patient how to turn the wheelchair. Instruct the patient to use more force on the left turning rim in order to turn right, and more force on the right turning rim in order to turn left (see figure 1-6).

(4) Ask the patient to demonstrate wheelchair techniques, offering guidance as necessary.

c. Several precautions must be observed when orthopedic patients are permitted to use a wheelchair.

(1) Tell the patient not to use the chair as a racing vehicle.

(2) Tell the patient to ask for assistance when going through doorways, entering elevators, or attempting to maneuver through congested areas.

(3) Tell the patient that braking devices must be set and the wheelchair braced against a wall or held while the patient gets in or out. This will prevent the chair from rolling or tipping when the patient shifts weight or changes position.

(4) Tell the patient to use the safety belt.

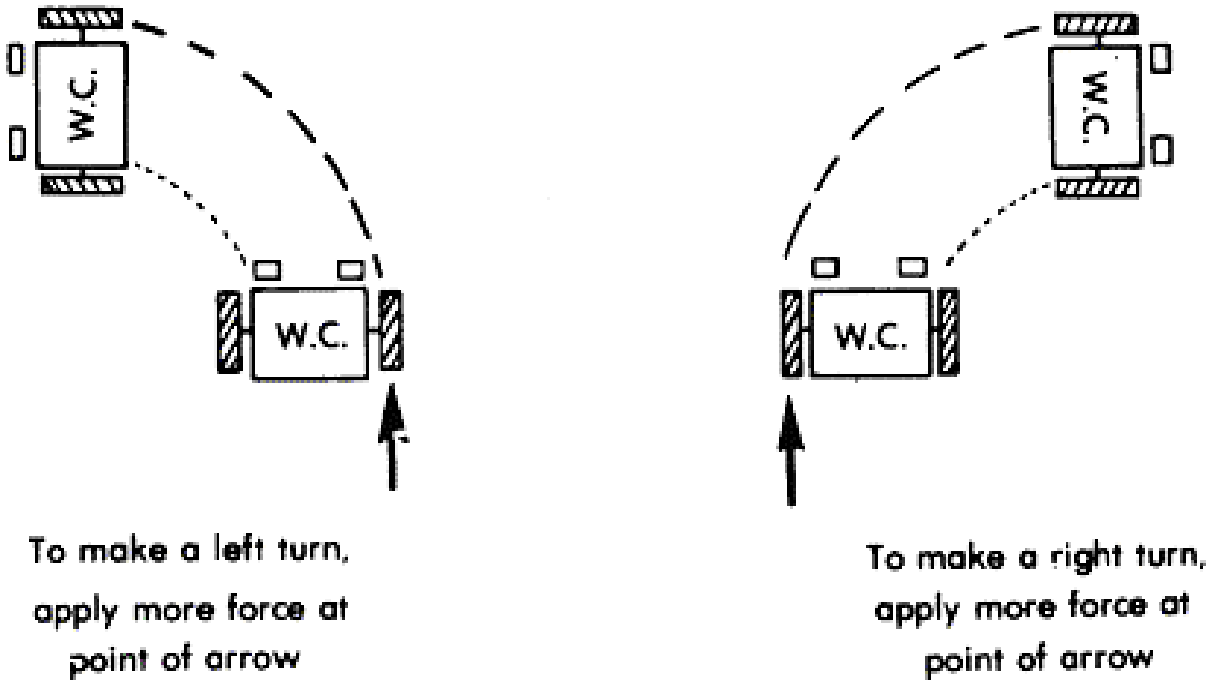


Figure 1-6. Turning in a wheelchair

1-12. CRUTCHES

a. Crutches are used to promote ambulation and independence in patients with affected lower extremities. The use of crutches is a complicated procedure that is routinely taught by the physical therapy department. There are occasions, however, when the nursing staff will have this responsibility. The physician will prescribe the use of crutches and the gait (crutch-walking method) to be used. The prescribed gait depends upon the amount of weight bearing permitted on the affected leg(s). The crutches must be "fitted" to the patient and instructions given for the prescribed crutch-walking method.

b. Standard axillary crutches need two adjustments--the length of the crutch and the position of the handgrip. Prior to adjusting, prepare the crutches with padding on the axillary bar and a rubber tip on the end of each crutch.

(1) Have the patient lie supine, arms at sides, wearing a shoe on the unaffected foot.

(2) Using a tape measure, measure from the axilla to the heel of the shoe and add two inches. Adjust the crutch shaft to this measurement. Or . . .

(3) Place the crutch along the patient's unaffected side with the axillary pad at the axilla and the crutch tip 6 to 8 inches to the side of the heel. Adjust the crutch to fit this length.

(4) Have the patient stand at the bedside with the crutches in place and grip the hand bars. You should be able to fit two fingers between the axilla and the axillary bar when the patient is standing in the tripod position (see figure 1-7).

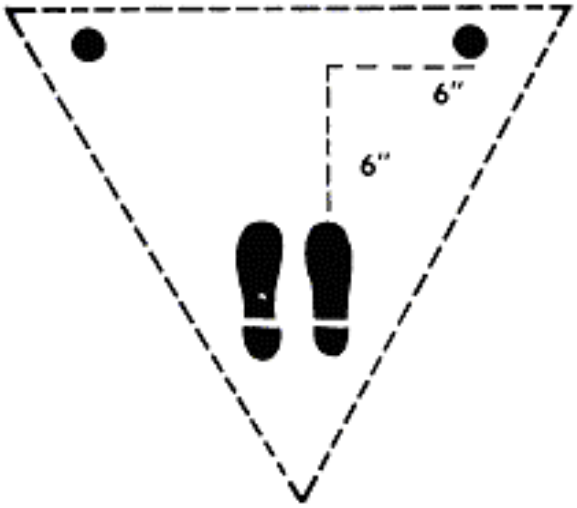


Figure 1-7. Tripod position.

(5) Adjust the hand bar so that the patient's elbow is flexed approximately 30° when the hand grips the hand bar.

(6) Check each crutch for proper fit and ask the patient if the crutch feels comfortable.

c. With properly fitted crutches, the patient is almost ready to learn ambulation with crutches. Prepare the patient for instruction by doing the following:

(1) Explain the procedure to the patient and determine if the patient has the upper body strength and ability to ambulate.

(2) Ensure that the patient is fully clothed and wearing non-skid slippers or shoes.

(3) Assist the patient to stand. Have the patient grasp both crutches in one hand at the handgrip, then push off from the bed with the free hand using the crutches for support.

(4) Instruct the patient to stand in correct body alignment with the tip of the crutches 6 inches in front and 6 inches to the side of the feet. (This is the tripod position.) The hands and arms, not the axillae, should bear the weight. The elbows should be flexed about 30°.

(5) Teach the prescribed gait.

1-13. CRUTCH WALKING GAITS

a. The 4-point gait (see figure 1-8) is used when the patient can bear some weight on both lower extremities. Place the patient in the tripod position and instruct him to do the following.

(1) Move the right crutch forward.

(2) Move the left foot forward.

(3) Move the left crutch forward.

(4) Move the right foot forward.

(5) Repeat this sequence of crutch-foot-crutch-foot for desired ambulation.

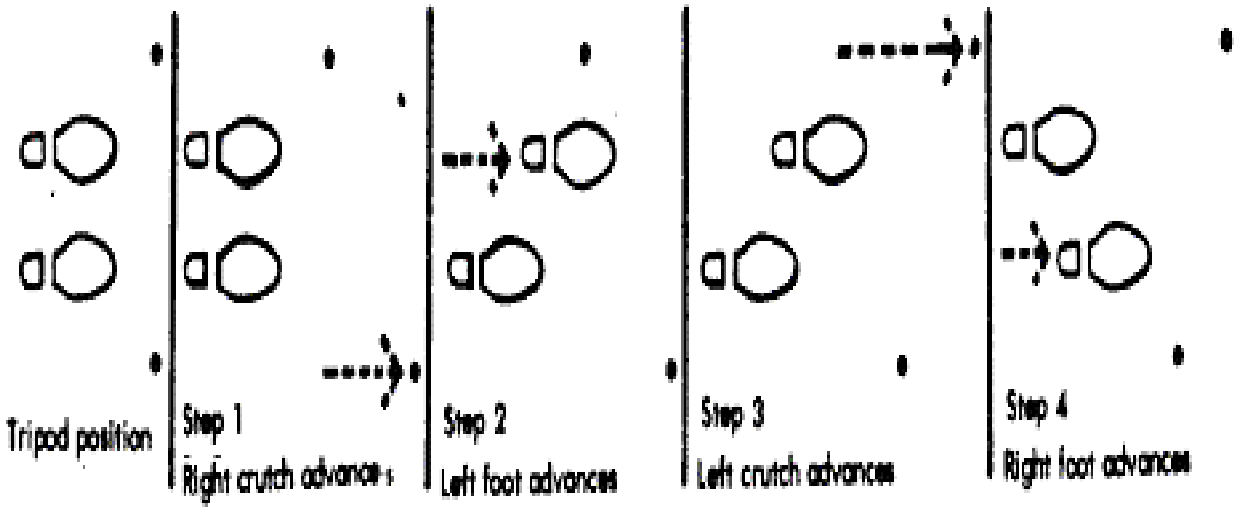


Figure 1-8. 4-point crutch walking gait.

b. The 3-point gait (see figure 1-9) is used when the patient should not bear any weight on the affected leg. Place the patient in the tripod position and instruct him to do the following.

(1) Move the affected (non-weight bearing) leg and both crutches forward together.

(2) Move the unaffected (weight bearing) leg forward.

(3) Repeat this sequence for desired ambulation.

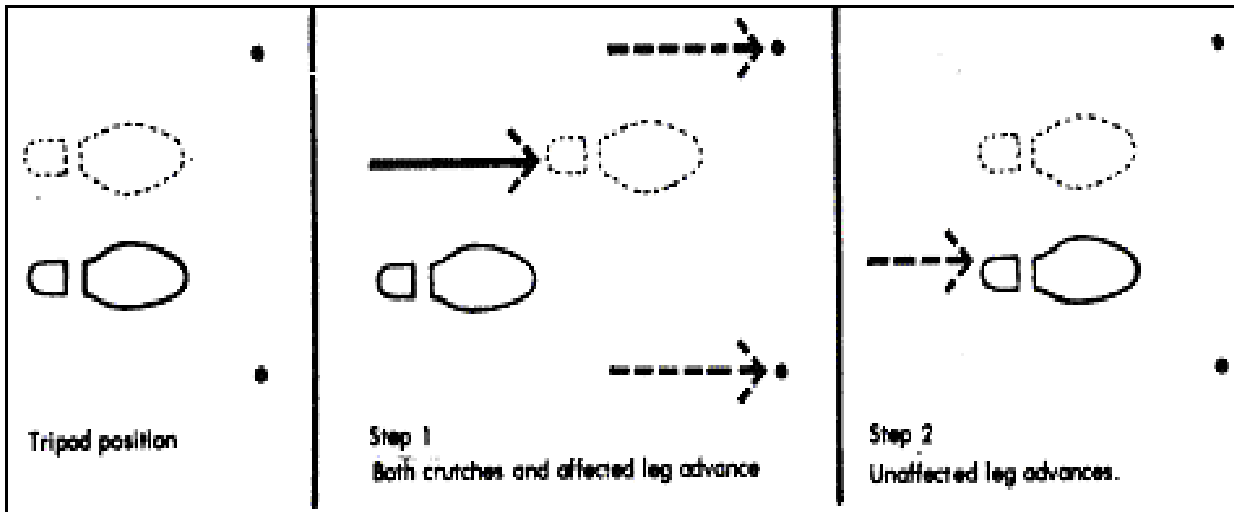


Figure 1-9. 3-point crutch walking gait.

c. The 2-point gait (see figure 1-10) is used when the patient can bear some weight on both lower extremities. Place the patient in the tripod position and instruct him to do the following.

(1) Move the right leg and left crutch forward together.

(2) Move the left leg and the right crutch forward together.

(3) Repeat this sequence for desired ambulation.

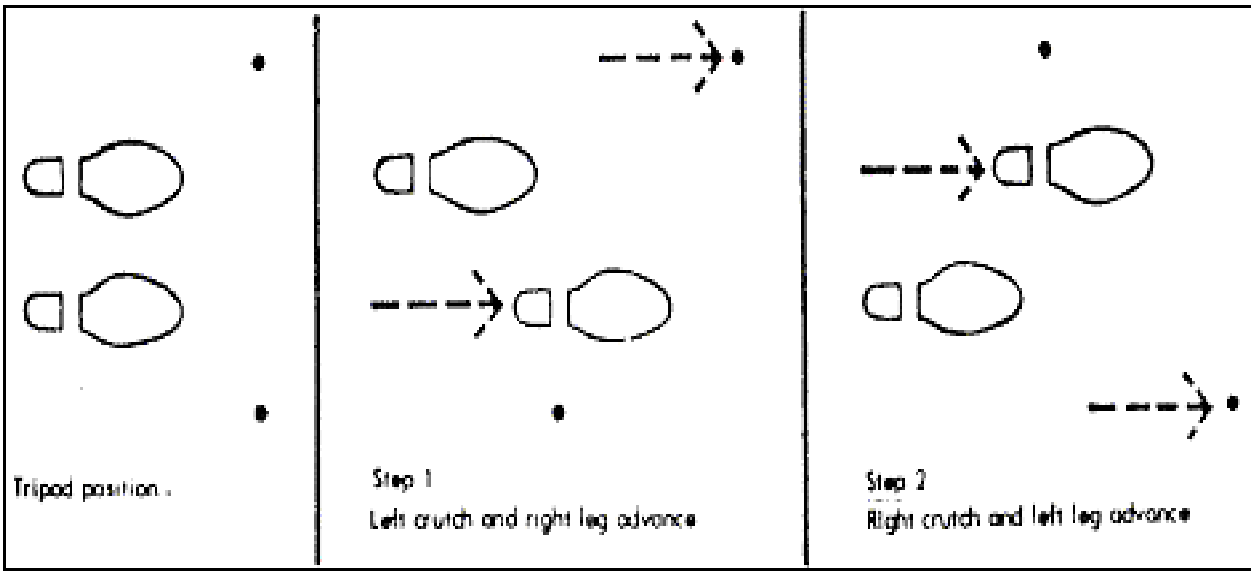


Figure 1-10. 2-point crutch walking gait.

d. Swing-through gait (see figure 1-11) is used for patients with lower extremities that are paralyzed and/or in braces. Place the patient in the tripod position and instruct him to do the following:

(1) Move both crutches forward together about 6 inches.

(2) Move both legs forward together about 6 inches.

(3) Repeat the sequence in rhythm for desired ambulation.

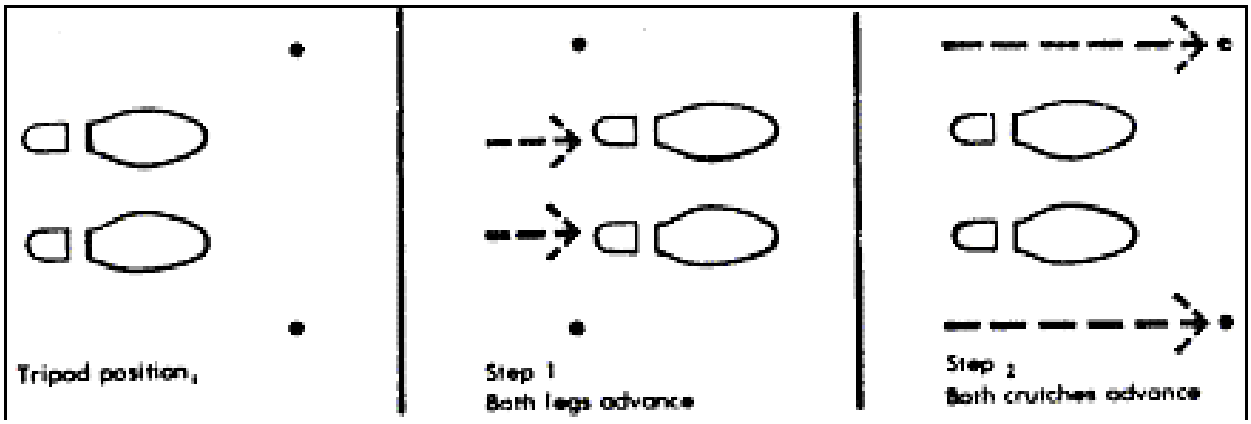


Figure 1-11. Swing-through gait.

1-14. WALKERS AND CANES

a. Walkers and canes are generally used as mobilization aids for patients who can bear weight on the affected leg, but require some support.

b. When utilizing a walker, the patient should use the muscles of the arms and upper body to help support his weight. After placing the walker in front of the patient, instruct the patient to ambulate with a walker using the following sequence of moves.

(1) Firmly grasp the hand grips.

(2) Move the walker and the affected leg forward about 6 inches.

(3) Move the unaffected leg forward, parallel to the affected leg.

(4) Repeat the sequence for each step.

c. The patient should hold a cane on the unaffected side with his elbow slightly flexed and the cane tip about 6 inches in front of and 6 inches to the side of his foot. (A cane is used for balance, rather than physical support. It is held on the unaffected side to prevent the patient from "leaning" on it for support.) Instruct the patient to ambulate using the following sequence.

(1) Move the affected leg forward, parallel to the cane.

(2) Move the unaffected leg forward so that the heel is just beyond the cane.

(3) Move the affected leg forward so that it is even with the unaffected leg.

(4) Move the cane forward 6 inches to the front and 6 inches to the side of the patient (starting position).

(5) Repeat the sequence for desired ambulation. If less support is needed, the cane and the affected leg can be moved together.

Section V. CASTS

1-15. INTRODUCTION

a. A cast is a device used for immobilization. Cast materials include plaster of Paris, fiberglass, and plastic. All come in rolls that can be applied in a manner similar to using an Ace bandage. Plaster casts are heavy, dry slowly, and lose strength and integrity if they become wet. Fiberglass and plastic casts are light in weight, dry quickly, and can be immersed in water and redried; however, they are expensive and may macerate underlying skin. Casts are usually applied by a trained orthopedic specialist under the supervision and direction of a physician.

b. Casts are used for several purposes.

(1) To immobilize fractures and hold bone fragments in reduction (placement for healing).

(2) To prevent movement in soft tissue injuries.

(3) To maintain proper alignment and correct deformities.

(4) To permit early mobilization.

1-16. TYPES OF CASTS

a. Short leg cast--extends from below the knee to the base of the toes.

b. Long leg cast--extends from the upper or middle thigh to the base of the toes.

c. Short arm cast--extends from below the elbow to the palm.

d. Thumb spica or gauntlet cast--extends from below the elbow to the palm and includes the thumb.

e. Long arm cast--extends from axilla to palm, with the elbow normally immobilized at a right angle.

f. Walking cast--a short or long leg cast with a rubber or metal walking device attached to the foot.

g. Body cast--encases the trunk.

h. Shoulder spica cast--a body cast that encases the trunk, shoulder, and elbow.

i. Hip spica cast--a body cast that encases the trunk and one or both lower extremities.

1-17. CARE OF THE PATIENT WITH A NEWLY APPLIED CAST

a. Expose a newly applied cast to air circulation. It should never be covered, because the cover will restrict the escape of moisture and heat. This is essential, as a drying cast generates heat within the plaster as the moisture evaporates and the cast hardens.

b. Handle a wet cast carefully. A newly applied cast is set and firm when the patient leaves the cast room, but it is still damp and easily damaged. It takes 24-48 hours for a cast to become dry and hard. Handle the cast by lifting and supporting it on a pillow or with the palms of the hands. Never use fingers as they will leave indentations, which cause pressure areas within the cast.

c. Provide plastic-covered pillows to support the cast along its entire length. Never permit the wet cast to rest directly on a flat or firm surface as this will flatten the contours of the cast and cause pressure within the cast.

d. Review the patient's clinical record for the type of cast and the reason the cast has been applied. Interview the patient to determine his knowledge of the cast purpose and whether he has had a cast before. Instruct the patient on care of the cast that is wet and after it is dry.

e. After a cast has cooled and begins to harden, elevate the casted extremity to reduce swelling which often occurs after application of a cast. When a newly applied cast is elevated, it should be supported along its entire length, on an inclined plane, with the distal joints higher than the proximal joints. For example, hand higher than elbow, elbow higher than shoulder.

f. Observe all edges of the cast for any areas that cut or put pressure on the skin.

g. Observe the extremity encased in plaster for circulatory impairment by comparing fingers or toes of the casted extremity with the uninvolved extremity. The primary concern following new cast application is to prevent complications. Circulation should be checked hourly during the first 24 to 48 hours, then every 4 hours.

(1) Check the skin temperature of the injured extremity. It should not be colder than the unaffected limb.

(2) Check and compare the pulses. They should be equal.

(3) Check for complaints of numbness, tingling, burning, swelling, pain, pressure, or inability to move the fingers or toes.

(4) Report presence of the above signs and symptoms IMMEDIATELY to avoid possible tissue necrosis; these findings indicate possible ischemia.

h. Perform the blanching (capillary refill) test. The nail beds of the fingers or toes are compressed lightly and released to check how quickly the color returns.

(1) With pressure applied, the nail bed should turn pale (blanch). When pressure is released, the color should return within the time it takes to say "capillary refill," indicating return of capillary action.

(2) Failure to blanch, or a blue tinge, indicates impaired venous circulation and congestion of tissues.

(3) Failure of color to return, or cold, pale fingers or toes suggests impaired arterial circulation.

(4) In either case, report findings IMMEDIATELY. Do not wait. Permanent damage can result from impaired circulation caused by cast pressure.

1-18. FINISHING THE DRY CAST

Cast edges may have been trimmed and finished with a smooth edge at the time of application or edges may be finished after the cast is dry.

a. When a cast is lined with stockinette, it may be pulled out from within the cast and folded back over the edges of the cast and taped in place. See figure 1-12.

b. Adhesive tape or moleskin may be used to cover rough edges of the cast by applying overlapping pieces in a "petal" fashion. See figure 1-12.

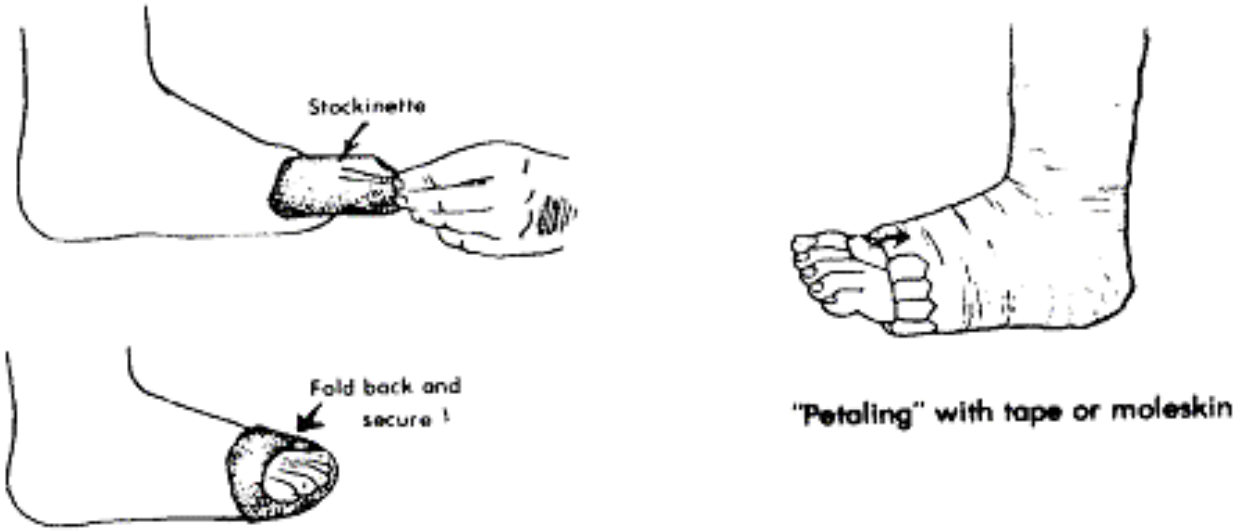


Figure 1-12. Finishing a cast.

c. Nursing implications. A cast without a smooth, unwrinkled finish is a potential source of problems.

(1) Rough, unfinished cast edges will scrape or cut the skin. Broken skin surfaces may become infected.

(2) Loose bits of plaster from an unfinished cast may become lodged inside the cast, causing itching and irritation.

(3) Wrinkled or "bunched-up" edging may result in pressure areas and potential skin breakdown.

1-19. CAST CUTTING

Casts may be cut for different reasons--to allow for wound dressings, to examine a painful area, or to relieve pressure. Nursing personnel may be required to assist with cast cutting at the bedside as an emergency measure.

a. **Bivalving the Cast.** Bivalving is the recommended method for emergency cutting to relieve pressure. In bivalving, the cast must be cut along its entire length on two sides (medial and lateral) and the base lining or padding cut completely down to the skin. If the cast or the lining is split only part way, the congestion will be increased and additional tissue damage will occur. To cut the cast, use a knife, a hand cutter, or an electric cast cutter. Use bandage scissors to cut the base material. To use a knife for emergency cast cutting, follow these steps.

(1) Make a shallow groove to indicate the cutting lines on both sides of the cast.

(2) Apply water or peroxide along the cutting lines to soften the plaster. Use a syringe to apply.

(3) With the knife, cut through the layers of plaster along the cutting line. Do not attempt to slice through all layers at once and do not use the knife to cut through the base material.

(4) With the bandage scissors, cut through the base material down to the skin. Cut every thread of the lining material completely through since the lining is sometimes the source of the trouble.

(5) Use tape or an elastic bandage to loosely hold the bivalve cast together in order to maintain support of the casted part until further instructions are obtained.

b. **Windowing the Cast**. This procedure is done on specific order of the physician. It is a potentially dangerous procedure because the underlying tissue may bulge through the window opening, causing "window edema." If a window is cut, the piece of plaster removed should be saved.

(1) The physician indicates the area to be windowed.

(2) The physician or orthopedic technician cuts the window, usually a square or rectangular area, out of the cast. Once the plaster has been cut out, the lining material is carefully cut away from the skin.

(3) After the physician examines and treats the underlying area, a dressing may be applied over the exposed skin area and the cutout piece of plaster bound in place again. Replacing the cutout plaster section will prevent window edema.

1-20. GENERAL NURSING MANAGEMENT OF THE PATIENT WITH A CAST

a. Although a patient with an arm or leg cast is much more self-reliant than a patient in a body or spice cast, it is a nursing responsibility to monitor all patients and assist as needed. Nursing management includes the following actions to assess the effectiveness of the cast.

(1) Check the edges of the cast and all skin areas where the cast edges may cause pressure. If there are signs of edema or circulatory impairment, notify the charge nurse or physician immediately.

(2) Slip your fingers under the cast edges to detect any plaster crumbs or other foreign material. Move the skin back and forth gently to stimulate circulation.

(3) Lean down and smell the cast to detect odors indicating tissue damage. A musty or moldy odor at the surface of the cast may be the first indication that necrosis from pressure has developed underneath.

(4) Check the integrity of the cast by looking for cracks, breaks, and soft spots.

b. The casted body part must be examined and assessed frequently in order to prevent complications. Assess the casted part by checking the following.

(1) Assess circulation by performing the blanching test and comparing the skin temperature and blanching reaction of the affected limb to that of the unaffected limb.

(2) Assess the presence of sensation in the affected limb by touching exposed areas of skin and instructing the patient to describe what he felt.

(3) Assess the motor ability of the affected limb by having the patient wiggle his fingers or toes.

c. Patient education will do much to prevent complications. Instruct the patient to do the following.

(1) Avoid resting cast on hard surfaces or sharp edges that may dent the cast and cause pressure areas.

(2) Never use a coat hanger or other foreign object to "scratch" inside the cast. This may cause skin damage and infection.

(3) Report any danger signs to the nursing staff immediately. Danger signs include pale, cold fingers or toes, tingling, numbness, increased pain, pressure spots, odor, or feeling that the cast has become too tight.

(4) Report any damage to the cast such as cracks, breaks, or soft spots.

(5) Never attempt to remove or alter the cast.

1-21. NURSING MANAGEMENT OF PATIENTS WITH EXTREMITY CASTS

a. After a leg cast is applied, prevent or alleviate swelling by elevating the extremity above the level of the heart. After the patient begins to ambulate, he should be encouraged to elevate the casted extremity when he is seated or resting in bed.

b. To control swelling with an arm cast, elevate the extremity on pillows or suspend in stockinet from an IV pole when the patient is lying or sitting. When the patient is ambulatory, a sling may be used for support. The type of sling required will

depend upon the type of cast applied. A standard short arm cast or long arm cast can normally be adequately supported with the triangular bandage sling. See figure 1-13. [Note: Cast is not shown.] A sling does not support the arm above heart level so, in order to promote drainage and reduce swelling, the patient should be encouraged to remove the sling and raise the arm above his head periodically.

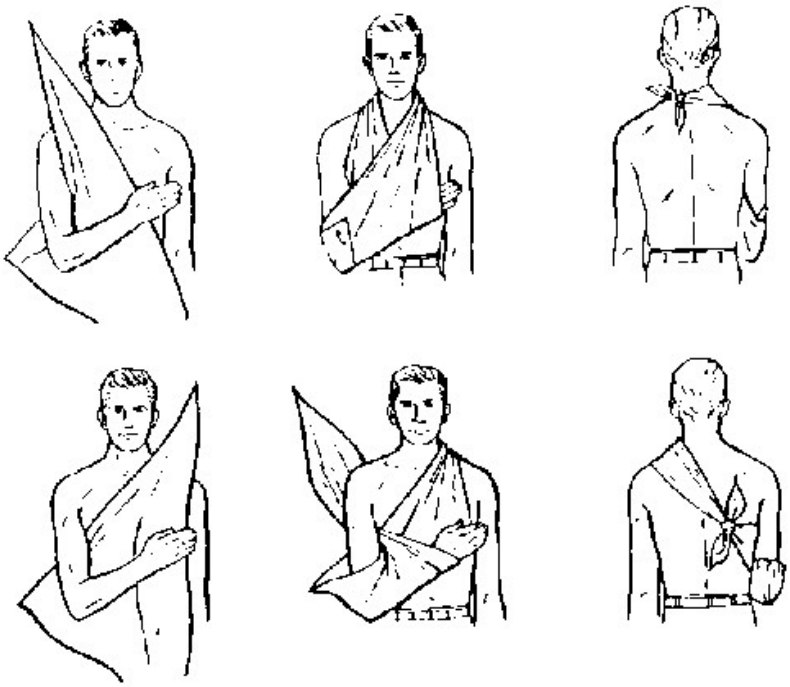


Figure 1-13. Triangular bandage sling.

c. If permitted by the physician, the patient should be encouraged to exercise his muscles. Isometric muscle contractions (contracting the muscle without moving the part) may be done to prevent atrophy and maintain muscle strength.

(1) If the patient is in a leg cast, have him lie down, place your hand under his knee and instruct him to "push down" toward your hand.

(2) If the patient has an arm cast, instruct him to make and release a tight fist.

(3) Encourage the patient to wiggle his fingers and toes frequently.

1-22. NURSING MANAGEMENT OF PATIENTS WITH BODY OR SPICA CASTS

a. When a large cast, such as a body cast or spice cast, is applied, the curves of the cast must be supported in order to prevent sagging and pressure. Support should be given to the entire cast, especially at weak areas such as the shoulder, hip, and knee. Small plastic-covered pillows should be placed under the cast in such a manner that there are no gaps between pillows.

b. A patient in a large cast will not be able to bathe without assistance. However, the patient must be encouraged to do as much for himself as is possible. Nursing personnel assist with those hygiene needs that the patient cannot manage alone. Each time the patient is turned to the prone position, wash the exposed back and buttocks and dry thoroughly. Apply lotion or powder and gently massage the skin to stimulate circulation.

c. When assisting with a urinal or bedpan, elevate the back and shoulders slightly higher than the buttocks to prevent dampening or soiling of the cast. Pillows may be used for support or, if the physician permits, the bed may be gatched up.

(1) Assist male patients with placement and removal of the urinal, if necessary.

(2) An emesis basin, slipped in place lengthwise, may be used by female patient for voiding. The basin is easier to place and remove than a bed pan.

(3) When assisting a patient with a bedpan, be certain that the buttocks are resting on the rim of the bedpan. The patient's head, shoulders, and back should be higher than the buttocks if at all possible.

(4) When a trapeze can be used, instruct the patient to lift straight up in order to avoid friction on the skin when placing and removing the bedpan.

(5) After using the urinal or bedpan, assist the patient to clean himself thoroughly. Check cast edges for soiling or dampness.

1-23. TURNING A PATIENT IN A SPICA CAST

Patients in body or spice casts must be turned from supine to prone to permit the cast to dry, to prevent pressure areas by redistribution of body weight, and to prevent respiratory and urinary complications. The patient is turned initially as ordered by the physician and must usually be turned a minimum of every two hours (unless otherwise indicated by the physician) for as long as he remains in the cast. Until the cast is thoroughly dry, at least three people should turn the patient so that there is no strain on the patient or on the damp cast. As the patient becomes accustomed to the cast and learns to help himself, less assistance may be required in turning the patient.

a. In any turning procedure, the patient must be turned "as a unit" with the affected side ("bad side") uppermost. The patient should be turned, or log-rolled, toward the unaffected side of his body ("good side").

b. Utilizing the pillows on which the patient is resting, and/or a draw sheet, move the patient to the side of the bed with a steady, even, pulling motion. Remember that the patient must be moved as a unit. When the patient is in the proper position, his "bad side" will be at the edge of the bed and his "good side" will be near the center of the bed.

c. One person should remain at the patient's affected side, while the others move to the opposite side of the bed to straighten the bed linen and position another set of pillows along side the patient. The pillows should be arranged so that they will support the cast and the patient's head and shoulders when you turn the patient.

d. The patient should be instructed to raise the arm on his unaffected side above his head.

e. The person on the patient's affected side should place his hands, with palms up, under the patient's torso.

f. The assistants on the patient's unaffected side should reach across the bed and place their hands, with palms down, on the patient's affected side. The person nearest the patient's head should place his hands on the patient's shoulder while the person nearest the patient's feet should place his hands on the patient's hip and leg.

g. Moving simultaneously, the person on the patient's affected side should gently draw the patient toward himself while the assistants on the opposite side ease the patient over toward themselves. Care should be taken to support the leg and arm on the affected side of the body.

h. After the patient has been turned, check the placement of the supporting pillows. Be sure that there are no gaps between pillows. When the patient is turned to the prone position, place a pillow under the lower legs to allow the feet to rest in the position of function and avoid having the toes pushed against the mattress.

i. Position a pillow under the patient's head and shoulders and be sure to place the call bell within his reach.

1-24. PATIENT CARE AFTER CAST REMOVAL

a. After a cast has been removed, continue to provide support to joints and normal body curves. The muscles will have become weakened from disuse and, although movement is encouraged, support is necessary. Use firm pillows to support the patient while in bed and use elastic bandages or an arm sling, if necessary, when the patient is up and about.

b. Avoid vigorous attempts to remove skin exudate and crusts of dead skin cells, which are present when a cast has been in place for several weeks. Gentle soaking and applications of oil to soften the skin and loosen crusts may be recommended.

c. After the cast is removed, the physician or physical therapist may prescribe exercises to increase strength. If the patient has been doing isometric muscle contractions, he will not have to "relearn" to contract his muscles and will progress more rapidly through rehabilitation. Atrophy of the part may be noticed, but this should gradually disappear with the return of muscle function. Swelling may develop for a while, but decreases with improved muscle tone and circulation as the patient becomes more active.

Section VI. TRACTION

1-25. TRACTION

a. Traction is the act of exerting a pulling force. To be therapeutic, traction applied in one direction requires countertraction (exertion of pull in the opposite direction). Countertraction is supplied by the patient's body weight and friction against the bed. Additional countertraction may be achieved by elevating the head or foot of the bed or by application of counter traction apparatus.

b. Traction is used to:

(1) Reduce and immobilize fractures.

(2) Prevent fracture deformities.

(3) Relieve muscle spasm.

(4) Reduce pain.

(5) Help regain the normal length and alignment of an injured extremity.

c. The basic methods of applying traction are referred to as skin traction and skeletal traction.

(1) Skin traction. Adhesive material is applied to a limb or a halter is fitted to the patient's head or pelvis. The adhesive material or the halter is then attached to a traction apparatus and force is exerted by means of a pulley and weights.

(2) Skeletal traction. Force is exerted directly on the bone by tongs inserted into the skull or a pin or wire inserted through the bone at a point distal to the fracture of an extremity. The tong, pin, or wire is then attached to the traction apparatus and force is exerted by means of pulleys and weights. A greater pull can be exerted by skeletal traction than by skin traction.

d. The two basic forms of traction that may be produced are referred to as balanced suspension traction and running traction.

(1) Balanced suspension traction. Direct pull on the part is applied with the extremity supported in a splint and held in place with balanced counterweights (examples: Thomas splint with Pearson attachment). The extremity "floats" or is suspended in the traction apparatus by the balanced weights. The line of traction on the extremity remains fairly constant despite any changes in the position of the patient. This principle may be utilized in both skin and skeletal traction and may be either unilateral or bilateral.

(2) Running traction. Direct pull is applied without support of the part (example: Buck's traction). The pull is exerted in only one plane. This principle may be utilized in both skin and skeletal traction, and may be either unilateral or bilateral.

1-26. PREPARING THE PATIENT AND HIS UNIT FOR TRACTION

a. There are many local variations in traction procedures, depending upon the preferences of the orthopedic surgeons. The nursing procedures described for the care of patients in traction are only guidelines and are subject to amendment by specific orders of the medical officer. In Department of the Army hospitals, an orthopedic technician usually assists the physician in application of traction. The nursing personnel may be required to assist occasionally, but it is not a nursing responsibility to construct traction. It is a nursing responsibility to recognize and report defects in the traction system so that the defects can be corrected by qualified personnel. The nursing personnel's primary responsibility lies in giving quality nursing care. In order to give effective nursing care to a patient in traction, one should have an understanding of the basic forms of traction and recognize some principle features of standard traction apparatus.

b. Check the physician's orders to determine the type and location of the traction to be applied before you prepare the patient for application of traction.

(1) Remove pajama trousers for application of traction to a lower limb. A towel should be provided for use as a loin-cloth style drape.

(2) Remove pajama coat for application of arm or cervical traction. If a pajama coat is used, it may be worn backward, leaving the affected arm free.

(3) Offer a bedpan or urinal prior to the start of the procedure.

(4) Assemble any equipment or dressing materials that may be needed.

c. Prepare the patient's bed with a firm mattress and a bedboard if one is required. Make the bed with a draw sheet over the bottom linen and fold the top linen back and leave untucked. Depending upon the type of traction to be applied, assemble the following equipment and complete the bed.

(1) Provide a footboard or sandbags to support the foot that is not in traction. Foot support for the leg in traction is usually provided by means of a footrest, attached when traction is applied.

(2) Attach an overhead Balkan frame with trapeze or an orthopedic head or footboard as appropriate.

(3) Provide several firm, plastic-covered pillows.

1-27. TRACTION APPARATUS

When working with traction apparatus, the following points should be observed routinely and any defect reported to the charge nurse.

a. **Weights**. The weights must hang free. Each weight bag must be tied securely to its rope. Avoid bumping or knocking the weight bags. They should not be allowed to swing back and forth. Weights should never be removed from a patient with a fracture unless so ordered by the physician or in the case of an extreme emergency. Weight and pulley traction is applied to provide constant corrective extension. If the weights are removed, the purpose of their use has been defeated.

b. **Ropes**. There should be no frayed spots or knots in the running length. They should not drag on the bedclothes or the bed frame. No ropes should rest against one another.

c. **Pulleys**. The rope should rest securely in the pulley grooves. Pulley clamps must be securely attached to the bed frame and must not be moved unless ordered by the physician.

d. **Spreader Bars**. The spreader bars should cause no pressure on adjacent skin areas.

e. **Footplate**. The footplate should maintain and support the foot in a neutral position, with no pressure on either side of the foot, the heel, or the toes. It must not rest against the foot of the bed, as this interferes with the traction pull.

f. **Trapeze**. The trapeze should be suspended from the overhead bar of the bed frame so that the patient can reach and grasp it without strain and without twisting out of proper alignment.

g. **Hammocks, Slings, and Halters**. These should be free of wrinkles and cause no pressure on bony prominence or joints. If padding material is used, it must be clean, dry, and free of wrinkles and crumbs.

1-28. SKIN TRACTION

a. Prior to application of the skin traction, inspect the skin for rashes, abrasions, or signs of circulatory impairment since the skin must be healthy in order to tolerate the traction. Check with the physician as to whether the skin should be shaved. Shaving is not always advisable because of the possibility of skin irritation or subsequent ingrowing hair problems. The extremity should be clean and dry before anything is applied to the skin.

b. Assist with the application of skin traction and arrangement of the traction apparatus as directed by the physician. Understand the nature of the traction and the

patient movement that is permissible while still maintaining the desired traction pull. The basic position of the patient and permissible movement differ according to the type of traction used and these factors determine the basic nursing care plan. The following paragraphs discuss several of the most commonly used forms of skin traction.

1-29. BUCK'S EXTENSION TRACTION

a. This form of skin traction to the lower limb (see figure 1-14) provides for straight pull through a single pulley attached to a crossbar at the foot of the bed. The limb in traction lies parallel to the bed. The foot of the bed is routinely elevated to provide counter traction and to keep the patient from being pulled down to the foot of the bed. In Buck's extension traction, the patient is usually not allowed to turn and must remain flat on his back.

b. Check alignment of the leg to maintain a straight line of pull from the rope attached to the spreader bar to the pulley mounted on the foot of the bed. Also check the bandage wrappings and tape or moleskin strips to be sure that they are adhering properly and have not slipped downward. Report immediately if any part of the wrappings or traction apparatus appears to be out of place.

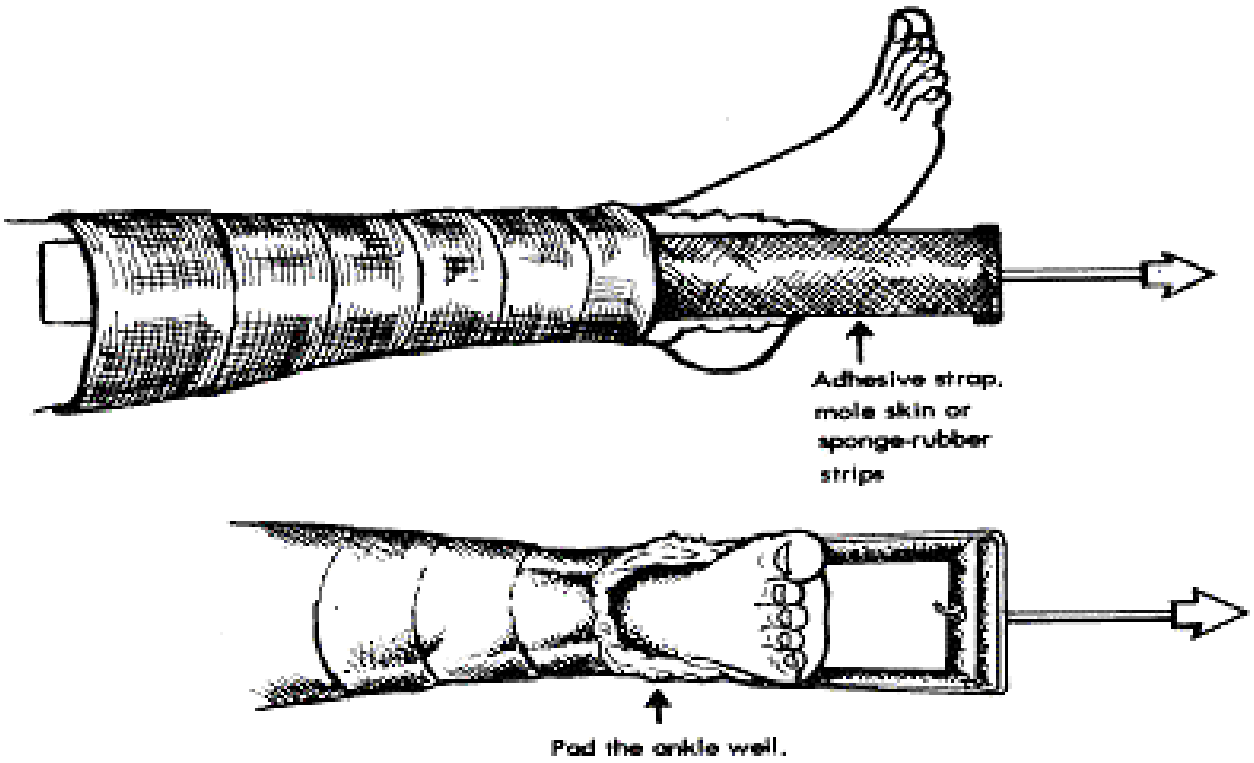


Figure 1-14. Buck's traction.

1-30. RUSSELL TRACTION

a. In this form of skin traction, a system of suspension and traction pull is used. Adhesive strips are applied as in Buck's extension, and the knee is suspended in a sling. A rope is attached to the sling's spreader bar. This rope passes over a pulley which is attached to an overhead bar and is then directed to a system of three pulleys at the foot of the bed: first to a pulley on the bed's foot bar, next to a pulley attached to the foot spreader bar, and then back to a second pulley on the bed's foot bar. There is an upward pull from the sling pulley and a forward pull from the pulleys at the foot of the bed. In Russell traction, the angle between the thigh and the bed is approximately 20° and there is always slight flexion of both the hip and the knee. The advantage of Russell traction is that some movement in bed is permissible. The patient can turn slightly toward the side in traction for back care, bedpan placement, or linen change.

b. Check the popliteal space for signs of pressure from the sling such as redness, indentations, abrasions, or pain. Check all the tape and wrappings as in Buck's traction. Keep the patient from sliding down the bed. The foot of the bed may be elevated to help prevent this.

1-31. PELVIC TRACTION GIRDLE

a. The pelvic traction girdle is ordinarily used for treatment of low back pain and muscle spasm. It is fitted snugly and evenly over the iliac crests. The traction straps, extending on the lateral side of each thigh, are hooked to a separate rope at mid-thigh level and each rope leads to a separate but equal weight at the foot of the bed. The foot of the bed is usually elevated to provide counter traction.

b. Keep the girdle and the underlying skin clean and dry. Avoid using padding unless the patient is very thin or the iliac crests are very prominent. Protect and support the feet. Foot exercises are usually encouraged, but there must be no contact with the traction ropes. The physician's orders may specify when the girdle may be removed for skin care or bathroom privileges.

1-32. PELVIC TRACTION SLING

a. The pelvic traction sling is used in the treatment of pelvic fracture. The patient is placed in a canvas sling or hammock that is suspended by a tension spring to an overhead frame bar. The pelvis is suspended so that it is just off the mattress.

b. Padding may be placed along the sling edges or as needed to relieve pressure on the coccyx. Keep the sling, the padding, and the skin clean and dry.

1-33. CERVICAL TRACTION HALTER

a. A canvas head halter is used for treatment of affections of the cervical spine. The halter fits snugly under the chin and around the back of the head against the

occipital protuberance. A pulley rope is attached to the spreader bar that hooks to the top of the harness. The prescribed weights at the end of the pulley rope keep the patient's neck and cervical spine in a position specified by the physician.

b. The patient's bed may be positioned in reverse to allow easier access to the patient's head. The head of the bed may be elevated to provide counter traction and to help prevent the patient's head or the spreader bar from resting against the bed frame. When positioning the bed, allow for plenty of room around the head of the bed in order to prevent bumping the weights.

c. Feed the patient slowly and carefully. If turning is not permitted, remind the patient to face forward and not turn toward the spoon, fork, or straw. Allow plenty of time for him to chew and swallow. Check to be certain that the chinstrap is not pressing on his throat. More importantly, keep suction equipment on hand for immediate use to prevent the patient from aspirating when eating, drinking, or receiving mouth care. Remember, if the patient chokes or vomits, he cannot be turned to the side or raised upward.

1-34. SKELETAL TRACTION

a. Skeletal traction is used most frequently in the treatment of fractures of the femur, the tibia, the humerus, and the cervical spine. The traction is applied directly to the bone by use of a metal pin or wire inserted into or through the bone or by tongs inserted into the skull. The pin, wire, or tong is then attached to the traction apparatus.

b. A significant problem with skeletal traction is the potential for infection, which could develop in or around the insertion site. The site must be inspected daily for drainage and odor. Daily cleaning and dressing changes may be prescribed by the physician or by local standing operating procedures.

c. The insertion of pins, wires, or tongs is often done in the operating room under anesthesia. Frequently, the patient will arrive on the ward with most of the traction apparatus already in place. Assist the physician or the orthopedic technician with positioning of the patient and arrangement of the traction apparatus. Because of differences in age, weight, body type, and the nature of the fracture itself, no two fractures can be considered alike and each patient will require individualized treatment. Therefore, traction procedures are modified for the requirements of each patient. It is extremely important that nursing personnel understand the nature of the traction in use and the patient movement that is permissible while still maintaining the desired traction pull. These factors will affect the planning of basic nursing care for that patient. The following paragraphs discuss several of the most commonly used forms of skeletal traction.

1-35. CERVICAL SKELETAL TRACTION

a. Crutchfield or Vinke tongs are used for skeletal traction in the treatment of fractures of the cervical spine. The tong points are inserted in the parietal area of the skull (just in the outer layers of the bone) and the tong is then attached to the pulling device. The procedures may be done under local anesthesia in the operating room or on the ward. With skeletal skull traction, the nursing care of the patient is usually less difficult than when a halter is used--the patient's head and face are relatively free of pressure and some turning in a "log-roll" fashion may be permissible for back care and bed making.

b. Prepare the bed as for cervical halter traction. Use an alternating pressure mattress, if one is available, when the patient is in a conventional bed. The patient in tong traction may be immobilized for a long period of time, so he may be placed on a Foster frame.

c. As with cervical halter traction, feed the patient slowly and with great care. Allow plenty of time to chew and swallow. Keep suction equipment at the bedside for emergency use.

1-36. SKELETAL TRACTION WIRE OR PIN

The Kirschner wire and Steinmann pin are commonly used devices in skeletal traction. The wire or pin insertion is always an aseptic procedure, and is usually done in the operating room. A local or general anesthesia is used, and all preoperative and postoperative precautions must be taken. The wire or pin is inserted through the bone, distal to the fracture site, and out through the skin on the other side. The sharp protruding ends of the pin or wire should be covered--corks are generally used for this purpose. A skeletal tractor device is fitted onto the wire or pin and traction is maintained by the weight, pulley, and rope attached to the skeletal tractor (see figure 1-15).

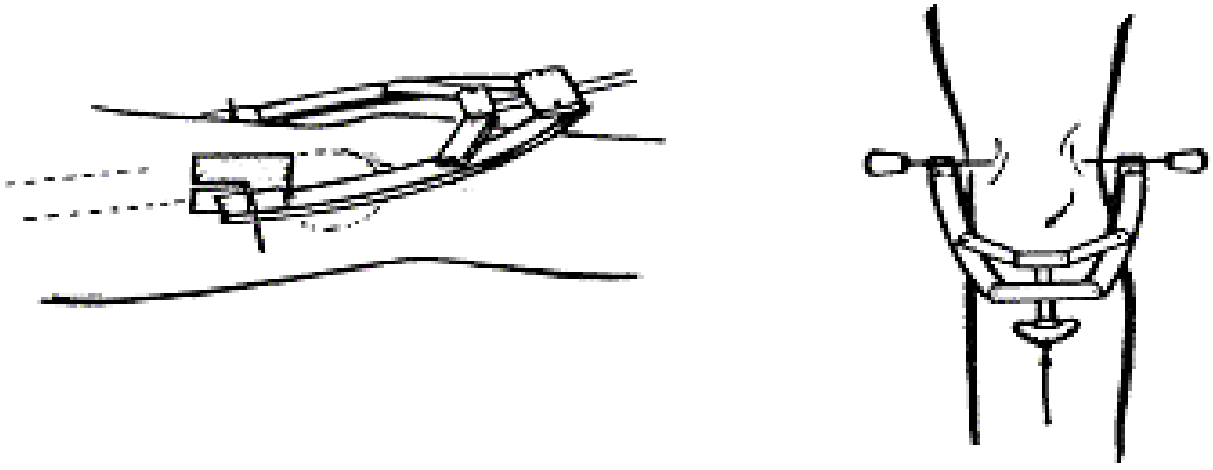


Figure 1-15. Skeletal tractor device.

1-37. SKELETAL TRACTION FOR THE FEMUR

a. The combination of skeletal traction and balanced suspension is widely used for the treatment of fractures of the femoral shaft (see figure 1-16). This method of treatment provides considerable freedom of body movement while maintaining efficient traction on the injured limb. The Thomas leg splint and Pearson attachment are used to achieve this balanced suspension traction.

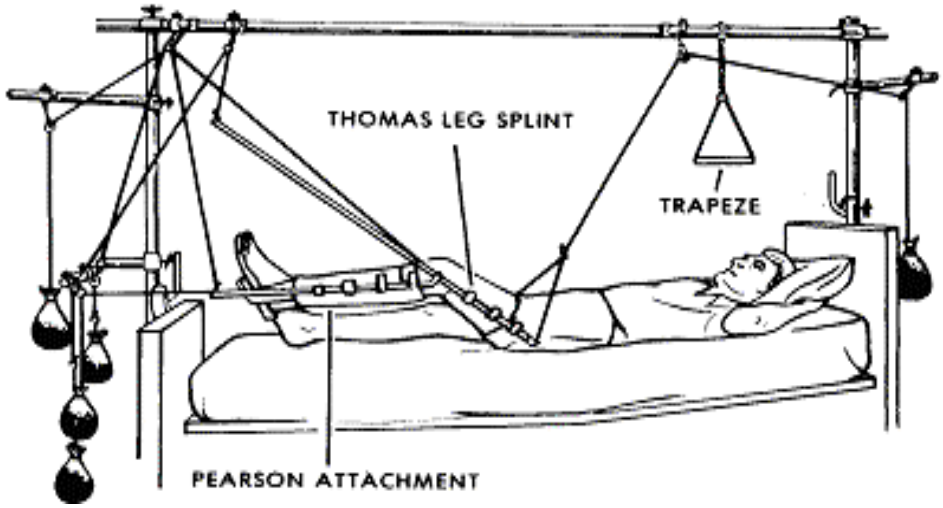


Figure 1-16. Balanced suspension traction.

b. The Thomas splint (half ring) is applied in various ways: with the ring fitted posteriorly against the ischium or anteriorly in the groin. The thigh rests in a canvas or bandage-strip sling with the popliteal space left free. The leather ring should not be wrapped or padded. If kept smooth, dry, and polished, the leather of the ring is designed to rest against the skin and resist moisture.

c. The Pearson attachment is attached by clamps to the Thomas splint at knee level. A canvas or bandage-strip sling supports the lower leg and provides the desired degree of knee flexion. A footplate is attached to the distal end of the Pearson attachment to support the foot in a neutral position. The heel should be left free.

d. The traction is in line with the long axis of the femoral shaft and is maintained by the rope, pulley, and weights attached to the skeletal tractor, which is fitted onto the wire or pin. Counter traction and balanced suspension are provided by the ropes, pulleys, and weights attached to the Pearson attachment. When all is operational, the thigh and Thomas splint will be suspended at about a 45° angle with the bed and the lower leg and Pearson attachment will be suspended horizontal to the mattress. The patient may sit up, turn toward the traction side, and raise his hips above the bed by means of the trapeze and still maintain the line of traction.

1-38. ARM TRACTION

a. The type of traction used for the upper extremities will depend upon the location of the fracture, any associated injuries, and the preference of the physician. As with other body parts, the arm may be immobilized in skin traction or skeletal traction. The position of the arm in traction may be sidearm or overhead. See figures 1-17 and 1-18. On occasion, the arm may be positioned in extension. This however, will cause muscle strain and elbow joint discomfort if immobilized in this position for more than a very short period of time.

b. Nursing care considerations for the patient immobilized in arm traction are the same as for any other immobilized patient. In addition, the nursing personnel must observe the following precautions:

(1) Compare the radial pulse on the affected side with the pulse on the unaffected side. Circulatory impairment must be reported immediately.

(2) Keep the elevated hand in a position of function at all times, and observe for pressure points at the wrist. Be sure that only the fingertips extend from the sling in the overhead traction set-up.

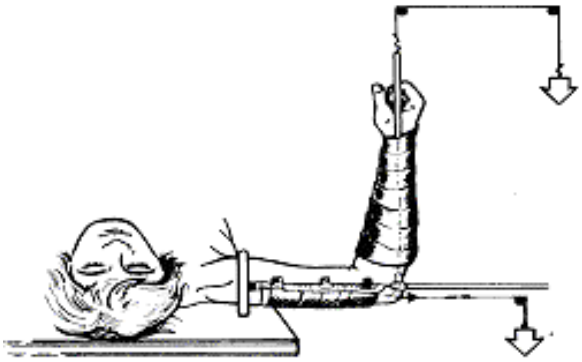


Figure 1-17. Side arm traction.

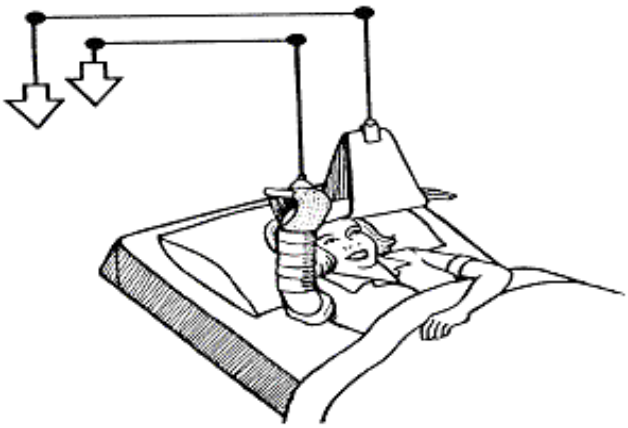


Figure 1-18. Overhead traction.

1-39. NURSING MANAGEMENT OF THE PATIENT IN TRACTION

As stated earlier in the text, the basis of the nursing care plan will be determined by two factors: the basic position of the patient in traction and permissible movement. Normal activities of daily living are significantly altered by immobilization and confinement. Nursing management begins with assessing the patient. What are his needs? What are his limitations? Determine which activities the patient can do by himself and with which activities he requires assistance. Basic considerations are nutritional needs, hygiene, and elimination needs and the need for some sort of diversional activities. In addition to this, nursing management involves maintenance (keep traction from being compromised) and prevention (observe for complications).

a. When assisting with a.m. and p.m. care, encourage the patient to do as much for himself as is possible within the constraints of his immobilization. Assist with or perform those tasks that the patient cannot perform.

b. Assess the patient and the traction set-up to determine the best method for changing the bed linen. There are several acceptable methods for making an occupied bed and, depending upon the type of traction in use, you will want to use the method that is easiest. For some patients, a head-to-toe technique may work better than side-to-side. Always be sure that the linen is smooth and dry. Utilize draw sheets when appropriate. Reposition supporting pillows and change the pillow cases as often as needed to prevent the patient from being supported by soiled, damp, wrinkled, or flattened pillows.

c. When assisting with the bedpan or urinal, provide adequate time and privacy for the patient. Many patients do not adjust easily to the awkwardness of using a bedpan or urinal. The presence of roommates, visitors, or hospital personnel just outside the privacy curtain is enough to make anyone uncomfortable. Always place toilet tissue, moist towelettes, and call bell within easy reach. Check daily to see whether the patient has had a bowel movement. Treating constipation will prevent the more serious problem of fecal impaction. Physicians will routinely prescribe a stool softener for immobilized patients in order to prevent constipation.

d. Encourage the patient to eat all of the prescribed diet. If permitted by the physician, suggest that family and friends bring fruit or a "healthy" favorite food from home. A recovering patient's diet should be high in calcium, protein, iron, and vitamins. Plenty of fluids and foods high in roughage will help prevent bowel and bladder complications.

e. Assist the patient to take several deep breaths each hour. Coughing and deep breathing will help prevent respiratory complications. Encourage the patient to actively exercise the unaffected extremities.

f. Eliminate any factors that reduce the traction pull or alter its direction. Ropes and pulleys should be in straight alignment and the ropes should be unobstructed.

Traction is NOT accomplished if the knot in the rope is touching the pulley or the foot of the bed. The weights must be suspended and not in contact with the bed or resting on the floor. The patient's body should always be in alignment with the force of traction. Check the patient's position each time you enter the room and help the patient slide up in bed if necessary. Encourage the patient to use the overhead trapeze instead of elbows to move in bed.

g. Check the extremities for color (pallor, cyanosis), numbness, edema, signs of infection, and pain. Look for areas of skin breakdown or pressure sores on all skin surfaces.

h. Orthopedic patients confined in traction will need some sort of diversional activity to relieve boredom and prevent depression. If your treatment facility has no occupational therapy department, encourage family and friends to visit frequently and bring books or games for the patient. Television and radio may also help to pass the time. The nursing personnel should make opportunities to stop and chat with the patient, both to distract the patient from boredom and to assess the patient's mental status. It is often easy to see a state of depression beginning and it will be easier to dispel in its early stages.

Section VII. CONTUSIONS, SPRAINS, STRAINS, AND DISLOCATIONS

1-40. CONTUSIONS

a. A contusion is an injury to the soft tissues caused by a blunt force such as a kick, fall, punch, or other similar impact. There is no associated break in the skin and it appears as an area of ecchymosis (a bruise). The rupture of small blood vessels cause hemorrhage into the injured area and this produces the familiar black-and-blue discoloration. As absorption of the blood takes place, the black-and-blue spot gradually changes color to brown-green, then to yellow, and finally disappears. A hematoma forms when the bleeding into the tissue is more than slight.

b. Nursing management consists of elevating the affected part and applying cold compresses for the first 8-12 hours after the injury. This produces vasoconstriction, which will reduce the hemorrhage and edema. Cold applications should be intermittent and continued for about 15-20 minutes at a time. After the first 8-12 hours, the recovery phase begins and moist heat should be applied. Again, applications should be intermittent and continued for about 20 minutes at a time. The application of heat will promote tissue repair and absorption of the blood.

1-41. SPRAINS

a. A sprain is an injury to a joint in which the ligaments, capsule, and surrounding tissues are partially torn or severely stretched. This type of injury is caused by wrenching or twisting the ligaments around the joint beyond their normal range of

movement. A sharp pain is felt at the time of the injury, accompanied by a sensation that there is no support in the injured joint. Rapid swelling and a decrease or loss of function in the joint will occur.

b. Nursing management for a sprain includes immobilization with a splint. If a splint is not available, adhesive tape or elastic bandages may be used. The joint should be rested and elevated whenever possible and cold compresses applied. The initial application of cold, and later application of heat, is done in the same manner as for a contusion.

1-42. STRAINS

a. A strain is the result of overstretching or overexertion of muscles or tendons so that some part of the musculature is stretched. A strain is usually due to a sudden body movement or to overexertion. Upon injury, pain or cramping will be felt. Other symptoms include swelling, heat, redness, and loss or function in the area of injury.

b. Nursing management includes placing the patient in a position of comfort to lessen the tension and reduce pressure. Immobilization of the affected area will reduce the pain and application of heat will usually provide relief as well.

1-43. DISLOCATIONS

a. A dislocation is the displacement of the normal association of the surface of the bones that make up the joint. Dislocations can be defined further as being partial or complete. A partial dislocation is one in which the surfaces of the joint are not completely separated. A complete dislocation is one in which the surfaces of the joint are fully separated.

b. A dislocation may occur in any bone joint. It may be traumatic, that is, caused by an injury or violence, or the injury may be caused by abnormal twisting or stretching. In addition, a dislocation may accompany a fracture. Symptoms include pain and deformity at the joint, loss of movement, swelling and discoloration around the joint, and even shock in severe cases.

c. Treatment of dislocation involves reduction and immobilization of the affected joint. Administration of analgesics for pain relief will be necessary. After reduction by the physician, an immobilization device is normally applied in order to prevent further injury.

d. Nursing management involves observation for complications and administration of ordered medications. If the dislocation has involved a major joint, the patient will require the same care and assistance given to any other immobilized patient.

Section VIII. FRACTURES

1-44. FRACTURES

a. A fracture is defined as a break in the continuity of a bone. Fractures occur when a bone is subjected to more stress than it is able to absorb. Fractures may occur from several specific causes and are categorized as follow.

(1) Direct force. In direct force fracture, a bone is subjected to more stress than it can absorb from an impact with a solid object. For example: a direct blow, as from a baseball bat, or a crushing force, such as some automobile accidents.

(2) Twisting. In a twisting (torsion) fracture, an indirect force may cause a break in a bone at a location other than the site of the twisting force. This type of injury is common in skiing accidents.

(3) Muscle contraction. In another indirect force fracture, powerful contraction of a muscle may cause the muscles to tear away from the bone, often fracturing or avulsing part of the bone in the process. This type of injury may occur during a grand mal seizure. This type fracture is seen in soldiers in an injury known as "grenade thrower's fracture." The humerus is fractured as a result of the muscular contractions in throwing a hand grenade.

(4) Pathological fracture. Bones that have become weakened from age or disease are easily fractured, often from just a slight movement.

(5) Fatigue or stress fracture. This type of injury may occur when a bone has been subjected to repeated stress. This phenomenon is commonly associated with sports enthusiasts and soldiers. The repeated stress of sustained running or marching may cause stress fractures of the feet or lower extremities.

b. Sometimes it will be quite obvious that a bone is fractured, but this is not always the case. An X-ray will often be necessary to make the diagnosis of fracture. Specific signs and symptoms will vary according to the type and location of the fracture. An open fracture with bone protruding from the wound is very obvious. In the case of a closed fracture, however, a fracture will be more difficult to assess. Some signs and symptoms associated with fractures are:

(1) Pain.

(2) Deformity (visible or palpable).

(3) False motion; abnormal mobility at the fracture site.

(4) Discoloration.

(5) Edema.

(6) Crepitus.

(7) Loss of function.

(8) Shortening of an extremity.

1-45. CLASSIFICATION OF FRACTURES

a. A great amount of soft tissue damage often accompanies a fracture. A fracture that is associated with a large amount of nerve, blood vessel, and soft tissue damage is called a complicated fracture. A fracture without other damage would be referred to as an uncomplicated fracture. The nature and extent of the damage depends upon the type and direction of the force causing the fracture. The direction of the force that causes the injury will also determine the direction of the fracture line. The following terms describe the direction of the fracture line in relation to the bone's longitudinal axis.

(1) Linear. A fracture line that runs parallel to the bone's axis.

(2) Longitudinal. A fracture line that runs along the length of, but not parallel to, the bone's axis.

(3) Transverse. A fracture line that runs across, or at a right angle to, the bone's axis.

(4) Oblique. A fracture line that slants across the bone.

(5) Spiral. A fracture line that runs across the bone at an oblique angle and coils or spirals around the bone.

b. Fractures are primarily classified as open or closed.

(1) Open. An open, or compound fracture is one in which there is an open wound associated with the fracture site.

(2) Closed. In a closed, or simple fracture, there is no break in the skin associated with the fracture.

c. Fractures are further classified according to the condition of the bone, as described below.

(1) Complete. The bone is completely broken or split apart.

(2) Incomplete. The bone is not completely split and part of the bone remains intact.

(3) Displaced. The bone ends are separated at the fracture line and are completely out of alignment.

(4) Impacted or compressed. The bone ends are wedged or jammed into each other.

(5) Depressed. A piece of bone is driven inward, as in a skull fracture.

(6) Comminuted. The bone shatters or fragments into several pieces.

(7) Greenstick. An incomplete fracture in which the bone is partially broken and partially bent. It is similar in appearance to a piece of "green" wood when broken.

d. There are other classification terms associated with fractures, such as identifying a fracture by its location on the shaft of a bone (distal, midshaft, or proximal), or identifying fractures by the name of the physician who first identified them (Colles', Pott's, and so forth). Any of the classification terms may be used together to better describe a particular fracture. For example: An open, complicated, complete, comminuted fracture would be one in which the bone is completely broken and fragmented with an associated break in the skin and involvement of nerves, blood vessels, and soft tissue. Refer to figure 1-19 to study the illustrations of these classification terms.

1-46. HEALING OF BONE

a. Bone healing follows an orderly sequence, and it begins the same as wound healing in any other part of the body. When a bone is fractured, hemorrhage between and around the bone ends will occur. Within 24 hours, a blood clot will form. This blood clot is invaded by cells that form granulation tissue. The cells in the newly formed granulation tissue differentiate and form a union of fibrous tissue known as a soft callus. This soft callus forms a "bridge" between the broken bone ends. Bone-forming cells begin to grow within the soft callus and the soft callus is gradually formed into a hard callus (ossification). There is then a firm bony union between the broken ends of the bone. In treating a fracture, the bones are brought into proper alignment and immobilized until X-rays show that a hard callus has formed.

b. Many factors influence the healing time of fractures and certain conditions may interfere with healing. If the realignment is poor, the bone ends may not meet or there may be soft tissue interposed between the bone ends. Union will not occur under such circumstances. Likewise, if the immobilization is inefficient, union may not occur. The age and physical condition of the patient, as well as dietary deficiencies, will affect the healing time. Additional factors in healing time are the type of fracture, its location, and the adequacy of the blood supply to the affected area. Finally, the presence of infection will severely handicap healing or prevent it altogether.

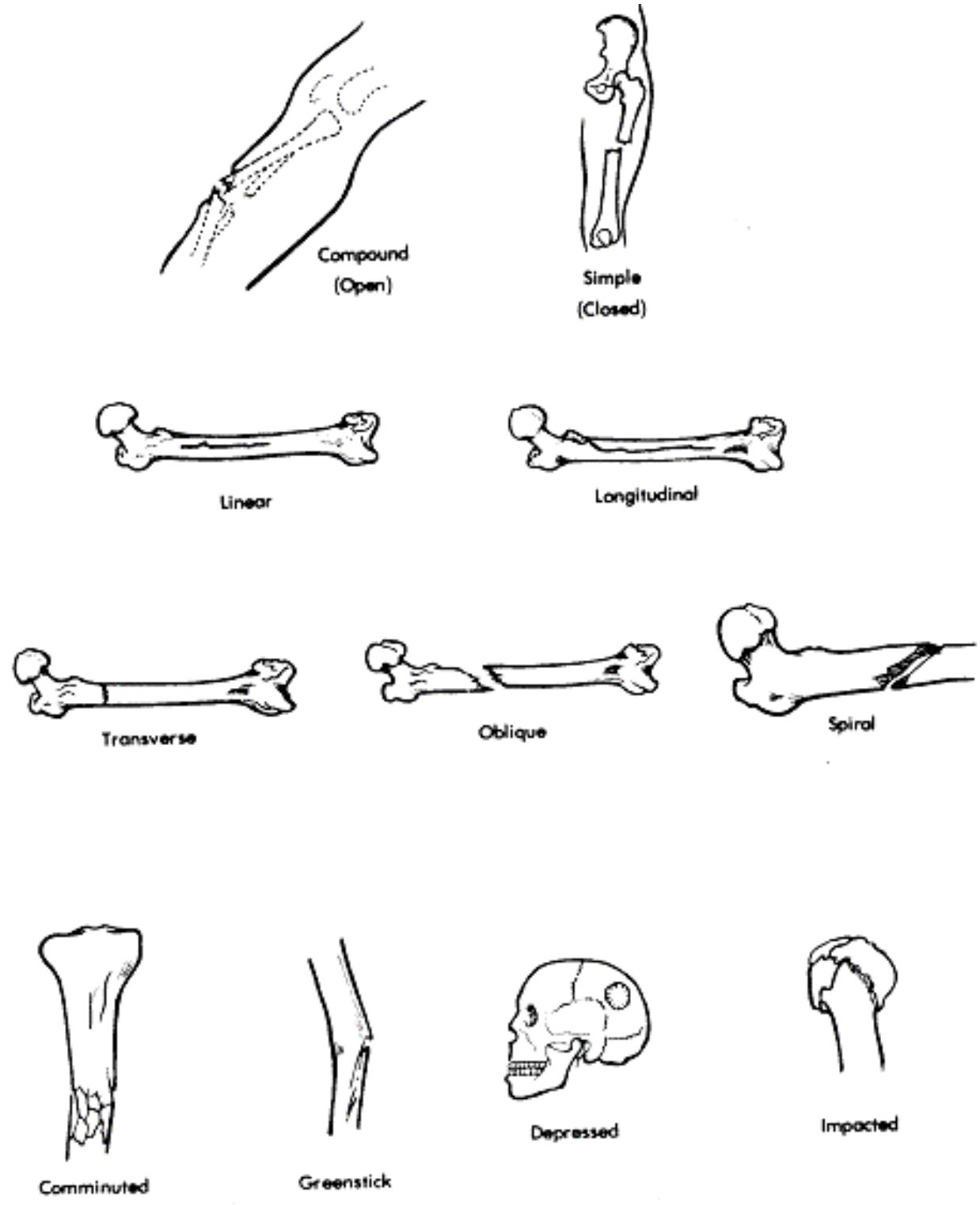


Figure 1-19. Fractures.

1-47. PRINCIPLES OF FRACTURE MANAGEMENT

a. In treating a fracture, the objectives of the treatment are as follows:

(1) To regain and maintain the normal alignment of the injured part.

(2) To regain normal function of the injured part.

(3) To achieve the above objectives for the patient in the shortest time possible.

b. The principles of fracture management are reduction, immobilization, and rehabilitation.

(1) Reduction. Reduction is the process of restoring the bone ends (and any fractured fragments) into their normal anatomical positions. This is accomplished by open or closed manipulation of the affected area, referred to as open reduction and closed reduction.

(a) Closed reduction is accomplished by bringing the bone ends into alignment by manipulation and manual traction. X-rays are taken to determine the position of the bones. A cast is normally applied to immobilize the extremity and maintain the reduction.

(b) In open reduction, a surgical opening is made, allowing the bones to be reduced manually under direct visualization. Frequently, internal fixation devices will be used to maintain the bone fragments in reduction.

(2) Immobilization. Immobilization is necessary to maintain fracture reduction until healing occurs. Immobilization may be accomplished by external or internal fixation.

(a) Methods of external fixation include casts, splints, and continuous traction.

(b) Internal fixation devices include pins, wires, screws, rods, nails, and plates. These devices, attached to the sides of the bone or inserted through the bone, provide internal immobilization of the bone.

(3) Rehabilitation. Rehabilitation is the regaining of strength and normal function in the affected area. Specific rehabilitation for each patient will be based upon the type of fracture and the methods of reduction and immobilization used. The physician will generally consult with the physical therapist to develop an individualized rehabilitation plan for each patient. This plan is normally implemented and controlled by the physical therapy department.

1-48. NURSING MANAGEMENT OF A PATIENT WITH A FRACTURE

a. Nursing care of a patient with a fracture, whether casted or in traction, is based upon prevention of complications while healing. By performing an accurate nursing assessment on a regular basis, the nursing staff can manage the patient's pain and prevent complications.

b. When assessing a patient with a fracture, check the "5 P's"--pain, pulse, pallor, paresthesia, and paralysis.

(1) Pain. Determine where the pain is located and if it is worse or better? Worsening pain may indicate increased edema, lack of adequate blood supply, or tissue damage.

(2) Pulse. Check the peripheral pulses, especially those distal to the fracture site. Compare all pulses with those on the unaffected side. Pulses should be strong and equal.

(3) Pallor. Observe the color and temperature of the skin, especially around the fracture site. Perform the capillary refill (blanching) test.

(4) Paresthesia. Examine the injured area for increase or decrease in sensation. Can the patient detect tactile stimulation such as a blunt touch or a sharp pinprick? Does the patient complain of numbness or tingling?

(5) Paralysis. Check the patient's mobility. Can he wiggle his toes and fingers? Can he move his extremities?

c. All nursing assessment findings should be documented in the patient's chart so that comparison can be made with notes made at both earlier and later dates. In this way, the patient's progress can be followed and changes in status are easily recognized. In addition to the five P's mentioned above, the patient's level of consciousness and temperature should be checked regularly. Mental status changes and temperature elevation could indicate the presence of infection. Reposition the patient as necessary to relieve pressure areas. Check all dressings, bandages, casts, splints, and traction equipment to ensure that nothing is causing constriction or pressure. Frequent and thorough checking and observation on the part of the nursing staff will promote healing and prevent complications.

1-49. LIFE THREATENING COMPLICATIONS

a. **Pulmonary Embolism**. Pulmonary embolism is the occlusion of the pulmonary arteries by a thrombus originating in the venous system. Patients with lower extremity fractures are most susceptible to pulmonary embolism due to their relative

inactivity. This condition may occur with or without symptoms. If symptoms do occur, they may present as substernal pain, dyspnea, apprehension, weak and rapid pulse, shock, or simply a subtle deterioration of the patient's condition for no obvious reason. The treatment ordered by the physician will be symptomatic and normally involves the use of anticoagulant therapy and elastic stockings.

b. **Fat Embolism**. In fat embolism, fat droplets enter the circulatory system, obstructing blood flow and causing inflammatory reactions in the affected vessels. Onset usually occurs within 24-72 hours after injury. Fat emboli in the lungs may result in defective transfer of respiratory gases, causing dyspnea and air hunger. Some emboli may affect the central nervous system and cause restlessness and confusion. Again, treatment addresses the signs and symptoms. Oxygen is normally administered and, if necessary, the physician will order intubation and mechanical ventilation. Anti-inflammatory and diuretic medications will often be used as well.

c. **Gas Gangrene**. Gas gangrene is a severe infection of skeletal muscle caused by the bacteria *Clostridium*. These bacteria are anaerobes and spore formers normally found in soil and in the intestinal tract of man. Gas gangrene occurs most often in wounds that have been grossly contaminated at the time of injury, in wounds that have a small but deep open wound area, and in wounds that have a compromised blood supply and therefore a decreased oxygen supply. Gas gangrene causes production of toxins and decomposition of tissue. Necrotic tissue will produce gas bubbles, which are evidenced by crepitus (crackling) in the soft tissue, along with severe pain and edema. Nursing personnel should observe for signs of apprehension, fever, chills, increased pulse, increased respiratory rate, and frothy foul-smelling drainage from the wound. Strict nursing observation is critical for patients with susceptible wounds because gas gangrene will often progress to a severe stage deep in the tissue before any signs or symptoms become evident. In treating gas gangrene, the physician will open the wound for debridement and irrigation. Antibiotic therapy and hyperbaric oxygen therapy will be initiated. Frequently, amputation of the affected extremity is necessary.

d. **Tetanus**. Tetanus is an acute infection caused by the tetanus bacillus, another anaerobic spore former. The bacteria is introduced through a wound that has been contaminated with soil, feces, or dust. Toxins that have an affinity for nervous tissue cause hyperirritability, restlessness, muscle rigidity, and tonic muscular spasms of almost every muscle group. The patient may have difficulty opening the mouth due to spasm of facial muscles. Tetanus is sometimes referred to as "lockjaw" for this reason. Treatment is similar in nature to that of gangrene, with the addition of anti-convulsive drugs.

Section IX. AMPUTATION

1-50. AMPUTATION

a. Surgical amputation of a limb is done to remove dead or unhealthy tissue that cannot be treated by any other means. In many cases, amputation is done as a lifesaving measure. Reasons for amputation include the following.

(1) Trauma. Injuries from combat, explosions, crushing injuries, and other trauma may necessitate amputation if the extent of the injury is quite severe.

(2) Thermal injuries. Electrical injuries, frostbite, and burns may be severe enough for amputation to be necessary.

(3) Peripheral vascular disease. Most nonemergency amputations are done because of severely compromised circulation due to vascular disease.

(4) Infection. In case of severe infection of the bone or soft tissue of a limb, amputation may be required. Osteomyelitis and gas gangrene are two such examples.

(5) Congenital deformity. In some cases, amputation is advised to remove a deformed and useless limb to permit the fitting of a functional prosthesis.

(6) Tumors. Malignancy that does not respond to any form of therapy and threatens to metastasize throughout the bone often results in amputation of all or part of a limb.

(7) Chronic pain. An extremity may be painful because of a circulatory problem or other disease process. Amputation may be indicated if the pain cannot be controlled in any other way.

b. Whatever the reason, amputation is a major operation. Long-range planning is necessary for the patient's rehabilitation; continuous care and teaching are necessary while the patient recovers.

1-51. THE SITE OF AMPUTATION

a. The exact location for the amputation of a limb is based on several factors. The physician will always strive to preserve as much of the limb as possible, but there are other considerations involved in the decision. For example:

(1) The blood supply available to the remaining limb.

(2) The functional ability of the remaining limb.

(3) The fitting of a functional prosthesis.

(4) The patient's age and overall physical condition.

(5) The patient's muscle strength.

(6) The patient's ability to learn.

b. The usual sites for amputation of a lower extremity include the foot, the ankle, below the knee (BKA), above the knee (AKA), at the hip (hip disarticulation), or at the pelvis (hemipelvectomy). Usual sites involved in amputation of part of an upper extremity include the fingers, at the wrist, below the elbow (BEA), above the elbow (AEA), and at the shoulder (shoulder disarticulation). The shoulder disarticulation, hip disarticulation, and hemipelvectomy are normally done only in cases of extensive injuries, malignancy, or gangrene. They are disabling and traumatic procedures, and done only as a last recourse.

c. Two basic types of amputation procedures are utilized. They are referred to as open, or guillotine amputation and closed, or flap amputation.

(1) The open amputation is performed when infection is present or likely to develop due to the circumstances of the injury or amputation. Tissue and bone are severed at the same level, and the wound is not closed, but left open to drain. Bulky dressings cover the stump end.

(2) The closed amputation is the preferred method as it usually heals faster and allows the patient to be fitted for and begin using a prosthetic device much sooner. When the tissue and bone are severed, skin flaps are left to cover the stump end. Drains are placed in the wound and the skin flaps are sutured.

1-52. NURSING CARE AND PATIENT EDUCATION

a. Preoperative care and patient education can be done in cases of elective amputation. There is time to prepare the patient for what lies ahead. In the case of a traumatic amputation, this may not be possible. Preoperative nursing care and patient education for the patient about to undergo amputation of all or part of a limb includes the following.

(1) Build the patient's strength by implementing muscular exercises for the unaffected limbs.

(2) Improve the patient's nutritional status by encouraging a balanced diet high in vitamins and minerals and with adequate protein to enhance wound healing. Maintain adequate hydration.

(3) Follow the physician's orders for therapeutic measures used to stabilize any chronic medical conditions such as diabetes, hypertension, or any other condition that may interfere with surgery or rehabilitation.

(4) If ordered, arrange preoperative counseling with the physical therapist. If a mobilization aid such as a walker or crutches is to be used postoperatively, it is easier to provide instruction in the preoperative period. The physical therapist will also inform the patient about his postoperative rehabilitation program.

(5) If authorized by the physician, schedule a visit from the prosthetic specialist. This may help to alleviate some of the patient's anxieties about the fitting and wear of prosthetic devices.

b. Postoperative nursing care involves routine nursing observation, pain control, positioning and exercise, stump conditioning, and patient education. Patient education should be done in conjunction with all nursing interventions.

(1) Monitor the patient's vital signs closely for changes in pulse or blood pressure that may indicate hemorrhage under the bulky dressing. A temperature elevation may indicate the presence of infection.

(2) Check the stump dressing regularly. Evidence of bloody drainage should be marked with date and time, and excessive bleeding reported to the physician. Check the proximal end of the stump dressing for swelling. The dressings are applied to provide some compression of the stump, but a dressing that is too tight may cause ischemia at the stump end.

(3) Observe the patient for pain. Pain medication may be required for several days post-operatively. Some patients experience a phenomenon known as "phantom pain" or "phantom sensation" in which they "feel" the lost limb.

(4) Maintain the prescribed position of the stump. Depending upon the type of procedure used, the extremity may be in a splint, in traction, or elevated on pillows. Proper positioning will prevent contracture of the involved muscles.

(5) Encourage prescribed exercises to preserve the range of motion in the affected limb and to strengthen the remaining limbs.

(6) Remove and reapply the bandage. When the wound is healed, the stump must be conditioned and shaped for the proper fitting of a prosthesis. A special bandaging technique is used to shrink and mold the stump to a smooth, conical shape. During the shaping process, the bandage is worn day and night. It is customarily removed and reapplied twice daily or as ordered by the physician. Different methods

are employed in wrapping the bandage, but the objective is the same: to provide equal, firm compression to the stump. A criss-cross or spiral pattern is used to avoid constricting the stump and interfering with circulation. One technique for wrapping a stump is illustrated in figure 1-20.

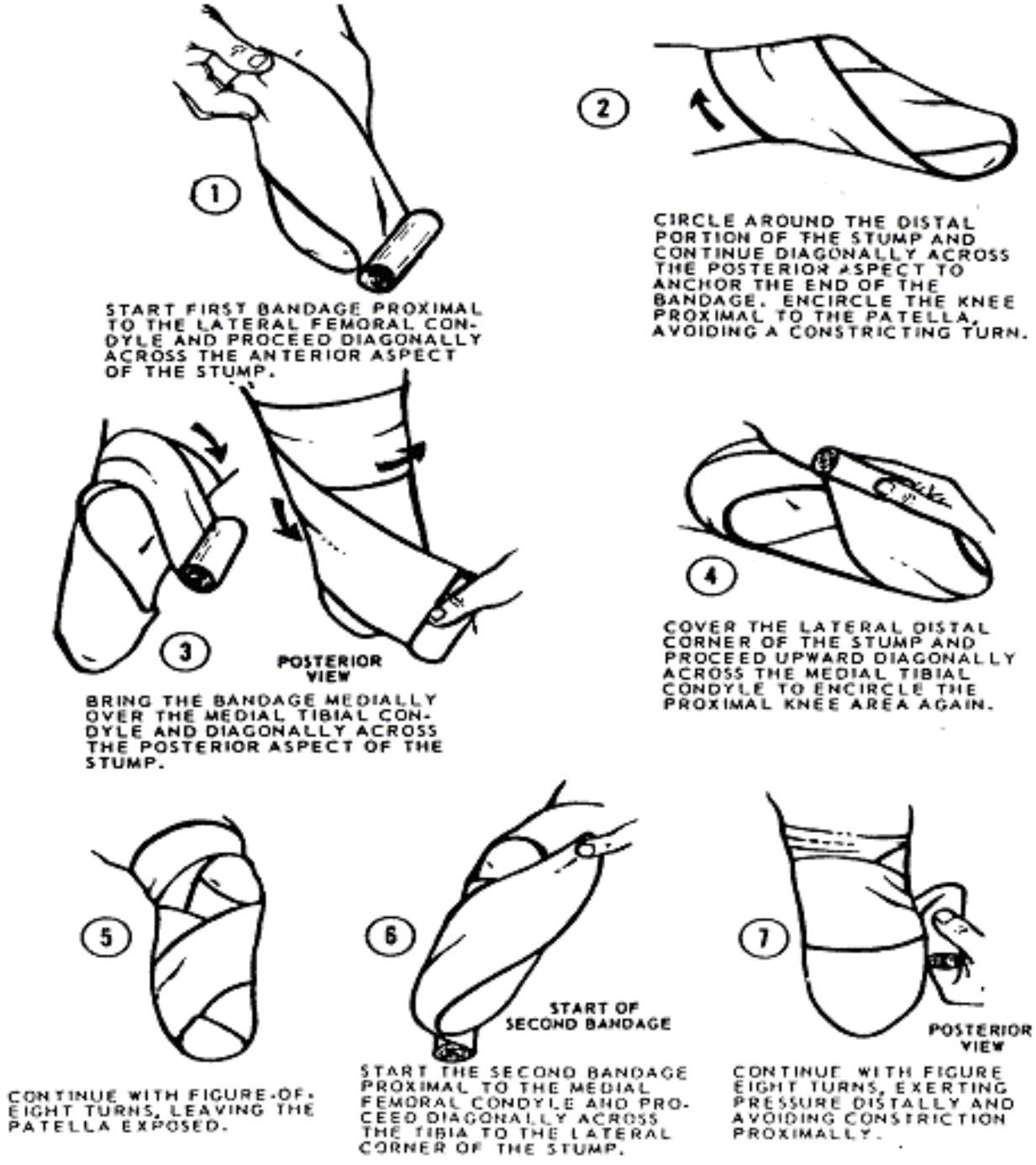

1
START FIRST BANDAGE PROXIMAL TO THE LATERAL FEMORAL CONDYLE AND PROCEED DIAGONALLY ACROSS THE ANTERIOR ASPECT OF THE STUMP.
2
CIRCLE AROUND THE DISTAL PORTION OF THE STUMP AND CONTINUE DIAGONALLY ACROSS THE POSTERIOR ASPECT TO ANCHOR THE END OF THE BANDAGE. ENCIRCLE THE KNEE PROXIMAL TO THE PATELLA, AVOIDING A CONSTRICTING TURN.
3
POSTERIOR VIEW
BRING THE BANDAGE MEDIALLY OVER THE MEDIAL TIBIAL CONDYLE AND DIAGONALLY ACROSS THE POSTERIOR ASPECT OF THE STUMP.
4
COVER THE LATERAL DISTAL CORNER OF THE STUMP AND PROCEED UPWARD DIAGONALLY ACROSS THE MEDIAL TIBIAL CONDYLE TO ENCIRCLE THE PROXIMAL KNEE AREA AGAIN.
5
CONTINUE WITH FIGURE-OF-EIGHT TURNS, LEAVING THE PATELLA EXPOSED.
6
START OF SECOND BANDAGE
START THE SECOND BANDAGE PROXIMAL TO THE MEDIAL FEMORAL CONDYLE AND PROCEED DIAGONALLY ACROSS THE TIBIA TO THE LATERAL CORNER OF THE STUMP.
7
POSTERIOR VIEW
CONTINUE WITH FIGURE EIGHT TURNS, EXERTING PRESSURE DISTALLY AND AVOIDING CONSTRICTION PROXIMALLY.

Figure 1-20. Stump bandaging (right BKA).

c. Patient education and quality nursing care are important, but the nursing staff must be aware of how the patient feels about the amputation. Trying to compensate for a lost limb is a difficult adjustment for anyone to make. It can easily produce feelings of uselessness or inadequacy in the patient. How "handicapped" the patient feels will depend upon how he adjusts to the loss. Some patients may refuse to learn to care for the stump, or even look at it, while others may be eager to reach a speedy recovery. Each patient will require individualized assistance in learning to cope with his amputation. It is important for the nursing personnel to remember that any amputation results in a permanent loss that may interfere with the psychological, physical, or social needs of the individual.

Section X. RHEUMATOID ARTHRITIS, OSTEOARTHRITIS, AND GOUT

1-53. CONNECTIVE TISSUE DISORDERS

The musculoskeletal system consists of bones, muscles, joints, tendons, ligaments, cartilage, and bursae. These connective tissue structures are responsible for movement, storing calcium, producing blood cells, and protection and support of many organs. Arthritis, gout, and other related diseases can be collectively referred to as connective tissue disorders. Inflammation and subsequent destruction of these tissues result in joint dysfunction, secondary to pain with movement, and possible joint deformity. Any organ or body system may be affected by connective tissue disorder; for example, lungs, heart, and blood vessels.

1-54. RHEUMATOID ARTHRITIS

a. Rheumatoid arthritis is a chronic, progressive disease that affects the cartilage surface of the joints and other collagen tissues throughout the body. It is characterized by recurrent inflammation of the lining of joints (synovitis). This leads to formation of a tissue that adheres to the opposite joint surface, inhibiting motion (fibrous ankylosis). The restricting band of tissue becomes calcified, causing destruction of the joint (osseous ankylosis). See figure 1-21.

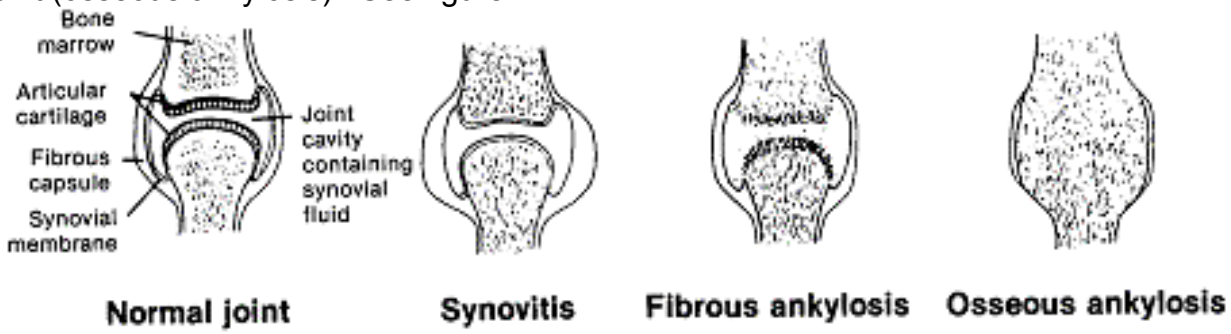


Figure 1-21. Pathological changes in rheumatoid arthritis.

b. Signs and symptoms of early stage rheumatoid arthritis are:

(1) Paresthesia (burning, prickling sensation).

(2) Anorexia.

(3) Night sweats.

(4) Generalized weakness.

(5) Warm, swollen, and painful joints.

(6) Mild to moderate pain.

c. Signs and symptoms of late stage rheumatoid arthritis are:

(1) Joint stiffness, especially in the morning.

(2) Muscular atrophy around the affected joint, leading to deformity.

(3) Chronic pain.

(4) Multiple organ involvement (pericarditis, osteoporosis, anemia, subcutaneous nodules, vasculitis, neuropathy, fibrotic lung disease).

d. Buffered or enteric coated aspirin and nonsteroidal anti-inflammatory drugs are given to decrease the inflammation that is causing the pain and destruction of the joint. If conservative treatment fails, adrenocortico-steroid drugs are given. Treatment will not reverse the structural damage incurred.

e. Nursing care implications include administering anti-inflammatory drugs as prescribed, providing hot or cold applications as ordered, assisting the patient with exercises, properly positioning the patient with pillows or sandbags to prevent and correct contracture deformities, and educating the patient regarding the disease.

1-55. OSTEOARTHRITIS

a. Osteoarthritis is the most common of all joint diseases. It is also known as degenerative joint disease. It is a slow, progressive thinning of the joint cartilage that exposes underlying bone to pressure, abrasion and erosion. Unlike rheumatoid arthritis, degenerative joint disease has no remissions and no systemic symptoms such as malaise and fever. Although the exact cause is not known, there appears to be an underlying metabolic abnormality of cartilage. The following predisposing factors are known:

(1) Aging (usually, late middle life and older).

(2) Joint injury.

(3) Obesity or excessive joint use.

(4) Genetic influences.

(5) Systemic diseases (hemophilia or due to organ transplantation.

(6) Poor posture.

b. Pathological changes include thinning cartilage, which exposes bone to articulating surfaces, and thickened synovial membrane. The fibrous tissue around the joint ossifies. Ankylosis does not occur. Signs and symptoms of osteoarthritis are:

(1) Pain in one or more joints, particularly after exercise and long periods of inactivity.

(2) Stiffness in the morning or at night.

(3) Joint enlargement.

(4) Limitation of joint motion.

c. The goal of patient care is relief of pain and discomfort. Rest of the affected joints and short periods of moderate exercise are helpful. Heat to the affected part may afford some relief of pain. Obese patients should lose weight. Analgesics are given for pain control. Anti-inflammatory agents are prescribed when synovial inflammation is present. Assistive devices such as splints, braces, cervical collars, or corsets are provided as necessary. Surgical procedures are used to repair or replace painful, nonfunctioning joints.

d. Nursing care implications include administering medications as prescribed, application of heat as ordered, assessing and reporting the postoperative patient's status, and educating the patient regarding the disease.

1-56. GOUT

a. Gout is a disease manifested by an acute inflammation of a joint. It occurs most often in men over 40. Primary gout is a metabolic disorder in which the body is unable to properly metabolize purines. Purines are end products of the digestion of certain proteins. This inability results in deposit of urate crystals (a salt of uric acid) in the joint and connective tissues. Secondary gout is an acquired disease resulting in underexcretion of uric acid. It occurs because of impaired renal function precipitated by trauma or prolonged use of diuretic agents, aspirin, or alcohol.

b. Pathological changes include elevated serum uric acid levels and uric acid crystals in the synovial fluid. Signs and symptoms of acute gout are sudden onset of severe joint pain, accompanied by intense inflammation, swelling, and tenderness. The first joint of the great toe is usually affected; and later, other joints of the foot become affected. Attacks involving the same joints tend to recur. In chronic gout, there may be development of renal calculi and deformity of the joints.

c. Patient care is directed toward decreasing the amount of sodium urate in the extracellular fluid so that deposits do not form. This is done by modifying the diet to decrease the amount of purine ingested and drug therapy to promote renal excretion of urates. Drug therapy must be continued after the acute phase to decrease the possibility of future attacks. Foods that should be limited are:

(1) Liver, kidney, and brains.

(2) Anchovies, sardines, and herring.

(3) Bacon, goose, and mutton.

(4) Salmon, turkey, and veal.

(5) Yeast, beer, and meat broth.

d. Nursing care implications include administering medication as ordered, documenting the patient's response, and observing the patient for side effects related to the medication.

Section XI. DRUGS

1-57. PAIN

a. Pain serves an important role. Pain can cause a person to allow injured parts time to heal and to seek medical care for disease or tissue damage. However, pain frequently persists long after its warning purpose has been achieved. Nursing care should be directed toward reducing the perception of (and reaction to) pain and enhancing the analgesic effect of medications.

b. Pain can be classified in various ways. It is often classified by intensity, such as mild, moderate, or severe. Pain may be classified by its source as superficial, visceral, or somatic. Superficial pain arises from the skin or mucous membranes. Visceral pain has its origin in smooth muscles and organ systems. Somatic pain arises from skeletal muscle, ligaments, vessels, or joints. Pain is also classified by the length of time it persists.

(1) Acute. Acute pain is typically caused by tissue injury. It has a sudden onset and it usually subsides with treatment. Acute pain generally lasts a few days.

(2) Subacute. Subacute pain is similar to acute pain and is expected to end when the tissue heals. It may persist for days or weeks.

(3) Recurrent. Recurrent pain is intermittent bouts of what is typically acute pain. The underlying cause of the pain may not be known.

(4) Chronic. Chronic pain is pain that persists longer than 6 months.

1-58. NONNARCOTIC ANALGESIC/ANTIPYRETIC DRUGS

a. Nonnarcotic analgesic/antipyretic drugs are used to relieve pain of mild to moderate intensity and reduce body temperature in selected febrile conditions. Examples are: acetylsalicylic acid (aspirin) and acetaminophen (Tylenol®, Datril®).

b. Nursing care implications consist of administering aspirin products with food or milk, monitoring the patient for complications from aspirin therapy, observing the patient for allergic reactions to the drugs, and monitoring the patient's temperature.

c. Gastric irritation or bleeding and tinnitus (sensation of ringing in the ears) are complications of aspirin therapy. Gastric side effects may be minimized by giving medication with a full glass of water or with milk, food, or an antacid. An exception is enteric-coated tablets, which may dissolve too quickly if taken with milk. Tinnitus is an indication of salicylate toxicity. The drug is generally discontinued with the onset of tinnitus. Inform the patient that the hearing impairment is reversible.

1-59. NONSTEROIDAL ANTI-INFLAMMATORY DRUGS

a. Nonsteroidal anti-inflammatory drugs (NSAIDs) are used to reduce inflammation and relieve pain. They appear to act by inhibiting an enzyme that is key to the formation of prostaglandins. Examples are indomethacin (Indocin®) and ibuprofen (Motrin®, Advil®, Nuprin®).

b. Nursing care implications include monitoring the patient for gastric irritation and careful observation of patients with impaired hepatic or renal function when administering these drugs.

c. These drugs should be given after meals. If gastric intolerance occurs, the physician may prescribe administration of the drug with food or milk or may decrease dosage. The absorption rate is slower when ibuprofen is given with food. The physician will rely on the nurse's accurate observation and reporting in order to estimate the lowest effective dosage level.

1-60. NARCOTICS

a. The active principles of opium are alkaloids, of which there are about twenty. Two opium alkaloids widely used in the practice of medicine are morphine and codeine.

Opium alkaloids and synthetic narcotics such as meperidine (Demerol®) are narcotic agonist that have an affinity for certain receptor sites and depress brain cells involved in pain perception.

b. Morphine and codeine act mainly on the central nervous system (CNS) where they produce a combination of depressing and stimulating effects. Papaverine has little effect on the nervous system, but produces relaxation of certain smooth muscles. The analgesic effect of morphine is indicated for the treatment of severe pain. Morphine may be administered orally, intramuscularly, intravenously, subcutaneously, epidurally, and rectally.

c. Frequently seen side effects of opioid use include vertigo, faintness, and lightheadedness, occurring most often in ambulatory patients. Less frequently seen side effects include dry mouth, headache, anorexia, abdominal cramping, nervousness, increased anxiety, mental confusion, urinary retention or painful urination, visual disturbances, and nightmares. Among the more serious adverse reactions are seizures, tinnitus, jaundice, breathing difficulties, and respiratory depression.

d. Nursing care implications consist of properly accounting for narcotics, observing the patient's response to the analgesic, and recording the degree and duration of pain relief and any adverse effects that may occur. Naloxone hydrochloride (Narcan®) is an opioid antagonist; that is, it can reverse opioid-induced respiratory depression and sedation by displacing the opioids at the receptor site. Naloxone should be available on nursing units where opioid medications are used.

1-61. CONCLUSION

a. This subcourse has introduced the basic nursing care techniques and procedures involved in the nursing care related to the musculoskeletal system.

b. Review the lesson objectives once again. If you feel confident that you have achieved the lesson objectives, complete the exercises at the end of this lesson.

c. If you do not feel that you have met the lesson objectives, review the necessary material before you attempt the end of lesson exercises.

Continue with Exercises

EXERCISES, LESSON 1

INSTRUCTIONS: Answer the following items by marking the lettered response that best answers the question, by completing the incomplete statement, or by writing the answer in the space provided at the end of the question.

After you have completed the exercise, turn to "Solutions to Exercise" at the end of the lesson and check your answers. For each item answered incorrectly, reread the material referenced with the solution.

1. An examination of an orthopedic patient should include an assessment of neurological function. This is done by checking the patient's _____, _____, and _____.

2. Terms used to describe the character of a patient's pain include cramping, throbbing, and shooting. Other terms are _____, _____ and _____.

3. A major advantage in the use of turning frames is _____ _____.

4. Standard axillary crutches need two adjustments. These adjustments are the _____ and the _____.

5. To avoid self-injury, those engaged in orthopedic nursing must understand and apply _____.

6. The 4-point crutch-walking gait is used when:

   a. The patient should bear no weight on the affected leg.

   b. The patient's lower extremities are paralyzed.

   c. The patient can bear some weight on both lower extremities.

7. Which of the following statements is NOT a reason for application of a cast?

   a. To correct deformities.

   b. To hold bone fragments in reduction.

   c. To prevent early mobilization.

   d. To immobilize fractures.

8. You are caring for a patient with a newly applied cast, which of the following actions would be incorrect?

   a. Expose the cast to air circulation.

   b. Support the cast with plastic covered pillows.

   c. Handle the cast with your palms.

   d. Cover the casted extremity.

9. A patient's newly casted extremity feels cold and color does not return when the blanching test is performed. This suggests _____.

10. "Petaling" is a technique used to _____.

11. When turning a patient in a spice cast, the patient should be turned with the _____ side uppermost.

12. List five purposes for the use of traction.

    _____.

    _____.

    _____.

    _____.

    _____.

13. The basic methods of applying traction are referred to as _____ and _____ .

14. Which of the following statements is NOT a correct statement?

    a. Traction weights should be securely tied to a rope.

    b. Traction weights should be removed only with the physician's authorization.

    c. Traction weights should hang free.

    d. Traction weights should be allowed to swing back and forth.

15. In_____, there an angle of approximately 20° between the thigh and the bed, with slight flexion of the hip and knee.

    a. Running traction.

    b. Balanced suspension traction.

    c. Buck's extension traction.

    d. Russell traction.

16. The combination of skeletal traction and balanced suspension is commonly used to treat _____.

17. An injury to a joint in which ligaments, capsule, and tissue are partially torn or severely stretched is a _____.

18. Fractures occur when a bone is subjected to more _____ than it can absorb.

19. _____ may occur easily from just a slight movement in bones that have become weakened with age or disease.

20. A fracture associated with a large amount of nerve, blood vessel, or soft tissue damage is called a _____ fracture.

21. In what type of fracture are the bone ends wedged or jammed into each other?

    a. Depressed.

    b. Impacted or compressed.

    c. Comminuted.

    d. Displaced.

22. Pain, false motion, edema, and crepitus are signs of a _____.

23. The process of restoring bone ends to their normal anatomical position is called _____.

24. Casting, splinting, and application of continuous traction are techniques of _____.

25. The principles of fracture management are _____, _____, and _____.

26. Which of the following is NOT one of the "5 P's" of assessment?

    a. Pain.

    b. Pressure.

    c. Paralysis.

    d. Pulse.

27. This life threatening complication may occur without symptoms. If symptoms do occur, they may be presented as substernal pain, dyspnea, apprehension, weak and rapid pulse, or shock. Which of the following was just described?

    a. Tetanus.

    b. Gas gangrene.

    c. Fat emboli.

    d. Pulmonary emboli.

28. Severe and uncontrolled infection, peripheral vascular disease, and chronic pain may be indications for _____.

29. The two types of amputation procedures are _____ and _____.

30. Proper positioning of the stump postoperatively will prevent _____.

31. Arthritis, gout, and other related diseases can be collectively referred to as _____.

32. One pathological change in patients with rheumatoid arthritis is _____ _____, which is the formation of tissue that adheres to the opposite joint surface, inhibiting motion.

33. _____ is also known as degenerative joint disease.

34. A pathological change in the affected joints of patients with osteoarthritis is _____ of cartilage and _____ synovial membrane.

35. Primary, _____ is a metabolic disorder in which the body is unable to properly metabolize purines. This inability results in deposit of _____ in the joint and connective tissues.

36. Drugs used to relieve pain of mild to moderate intensity and reduce body temperature in selected febrile conditions are _____ drugs.

37. _____ drugs are used to reduce inflammation and relieve pain.

38. Two opium alkaloids widely used in the practice of medicine are _____ and _____ .

39. Seizures, breathing difficulties, and respiratory depression may be serious adverse reactions to:

    a. Nonsteroidal anti-inflammatory drugs.

    b. Nonnarcotic analgesic/antipyretic drugs.

    c. Opium alkaloid narcotic agonist.

    d. Urate crystals.

40. Naloxone hydrochloride is an opioid _____ ; it can reverse opioid-induced respiratory depression and should be kept on the nursing unit where opioid medications are used.

Check Your Answers on Next Page

SOLUTIONS TO EXERCISE, LESSON 1

1. Reflexes, sensation, motor ability (para 1-3g)
2. Sharp, dull, piercing (para 1-7a(3))
3. The prevention of complications (para 1-9b)
4. Length of the crutch, position of the hand grip (para 1-12b)
5. Principles of body mechanics (para 1-2a)
6. c (para 1-13a)
7. c (para 1-15b)
8. d (para 1-17a, b, c)
9. Impaired arterial circulation (para 1-17h(3))
10. Finish a cast (para 1-18b and figure 1-12)
11. Affected (bad) (para 1-23a)
12. To reduce and immobilize fractures
    To prevent fracture deformities
    To relieve muscles spasm
    To reduce pain
    To help regain normal length and alignment (para 1-25b)
13. Skin traction, skeletal traction (para 1-25c)
14. d (para 1-27a)
15. d (para 1-30a)
16. Fractures of the femoral shaft (para 1-37a)
17. Sprain (para 1-41a)
18. Stress (para 1-44a)
19. Pathological fractures (para 1-44a(4))

20. Complicated (para 1-45a)

21. b (para 1-45c(4))

22. Fracture (para 1-44b)

23. Reduction (para 1-47b(1))

24. External fixation (para 1-47b(2)(a)

25. Reduction, immobilization, rehabilitation (para 1-47b)

26. b (para 1-48b)

27. d (para 1-49a)

28. Amputation (paras 1-50a(3), (4), (7))

29. Open (or guillotine) and closed (or flap) (para 1-51c)

30. Contractures (para 1-52b(4))

31. Connective tissue disorders (para 1-53)

32. Fibrous ankylosis (para 1-54a)

33. Osteoarthritis (para 1-55a)

34. Thinning, thickened (para 1-55b)

35. Gout, urate crystals (para 1-56a)

36. Nonnarcotic analgesic/antipyretic (para 1-58a)

37. Nonsteroidal anti-inflammatory (para 1-59a)

38. Morphine, codeine (para 1-60a)

39. c (para 1-60c)

40. Antagonist (para 1-60d)

End of Lesson 1

APPENDIX

UNIVERSAL BODY SUBSTANCE PRECAUTIONS

Prevention of Transmission of Human Immunodeficiency Virus and Other Blood-Borne Pathogens in Health Care Settings

Only blood, semen, vaginal secretions, and possibly breast milk have been implicated in transmission of human immunodeficiency virus (HIV), hepatitis B virus (HBV), and other blood-borne pathogens.

Blood is the single most important source of transmission of blood-borne pathogens in health care settings. Infection control efforts must focus on preventing exposures to blood.

Although the risk is unknown, universal precautions also apply to tissues and to cerebrospinal fluid, synovial fluid, pleural fluid, peritoneal fluid, and amniotic fluid.

Universal precautions do not apply to feces, nasal secretions, sputum, sweat, tears, urine, and vomitus unless they contain visible blood. Although universal precautions do not apply to these body substances, the wise nurse wears gloves for protection from other infections.

Precautions are used for *all* patients. (*Reason:* It is impossible to know which patients are infected with such conditions as HIV, HBV, or other infectious agents.)

Gloves are worn *whenever* the health care worker may come in contact with blood, body fluids containing blood, and other body fluids to which universal precautions apply. (*Reason:* Diseases can be carried in the body substances.)

Wear gloves *at all times* if you have any break in the skin of your hands. If you have an exudative condition, such as weeping dermatitis, you must be evaluated before working with patients and patient care equipment. (*Reason:* You may be at great risk of contracting a disease; you might also spread disease.)

Change gloves after each contact with a client. (*Reason:* The gloves may be contaminated.)

Wash your hands and skin surfaces immediately and thoroughly if they are contaminated with blood or body fluids. (*Reason:* Proper washing will help to stop the spread of infection.)

Wear a gown or apron when clothing could become soiled. (*Reason:* To prevent spread of infection to yourself or others.)

Wear a mask and eye protection if splashing is possible. Hospital protocol will determine what type of eye protection is required for each specific case. (*Reason:* Infection could enter your body through the mucous membranes of your mouth or nose or through your eyes.)

Dispose of sharp objects carefully. Do not recap or break needles. Needles and sharp objects are placed in a special container after use. (*Reason:* There is a possibility of accidental finger stick. It is important to protect yourself and housekeeping personnel.)

If you have an on-the-job accident that causes a break in the skin, notify your nursing supervisor *immediately*. (*Reason:* Immediate precautions must be taken to protect you.)

Special care is taken of a deceased patient's body. (*Reason:* To prevent leakage of body substances. It is safer to assume that all patients are infectious.)

All health care workers who perform or assist in vaginal or cesarean delivery should wear gloves and gowns when handling the placenta or the infant until blood and amniotic fluid have been removed from the infant's skin. Gloves should be worn until after postdelivery care of the umbilical cord.

Pregnant health care workers are not known to be at greater risk of contracting HIV infection than health care workers who are not pregnant; however, if a health care worker develops HIV infection during pregnancy, the infant is at risk. Because of this risk, pregnant health care workers should be especially familiar with and strictly adhere to precautions to minimize the risk of HIV transmission.

(Adapted from Centers for Disease Control: Recommendations for prevention of HIV transmission in health care settings. MMWR 36: Suppl. 25: 1987. Centers for Disease Control: Update: Universal precautions for prevention or transmission of human immunodeficiency virus, hepatitis B virus, and other blood-borne pathogens in health-care settings. MMWR 37: 24, 1988)

End of Appendix